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THE astounding news comes to us from St. Louis that Mr. Frederic Egner *has been requested to resign* his position as Engineer of the Laclede Gas Company, the resignation to take effect on May 31st. The resignation is requested on the ground that it is necessary to reduce expenditures. Mr. Egner has been in charge of the Laclede Company's works almost eight years, and that he has been faithful to his every duty goes without saying. The gentlemen in control of the stocks and bonds of the Laclede Company give Mr. Egner four day's notice! Later on their own notice to quit may be equally short.

THE LOUISVILLE MEETING.

Records and memories are all that remain now of the Fourteenth Annual Meeting of the Western Association, at Louisville, last month; but one could not ask for better testifiers to the worth and pleasure of the occasion. It is truly regrettable that rumor should have been so busy prior to the convention respecting probable lack of suitable hotel accomodation, in that such presage kept many from making the trip to Louisville, yet neither the Association nor its supporters may feel great discomfort in respect to this, since the attendance was quite up to the standard of the past. Further, it was representative, which, in the main, is the most important evidence of vitality in a body technical. Many were missed, but the more prominent of the absentees had paramount cause for remaining away—pressing business, sickness and sorrow were the restraining bonds. However, the Western has reason to congratulate itself over the grand result, and the Committee of Arrangements can be fully credited with having managed their onerous task with completeness, punctuality and unobtrusiveness. The one unpleasing feature of the convention was the meeting room, or rather its environment of roadway. The room itself was all right but the Louisville pavements were all wrong. The temperature was such that the windows could not be kept closed all the time, and as cobblestone, tired wheels, and straining horses and mules can be counted on to cause creaking and rumbling it may be taken for granted that the paper reading and discussions were frequently punctuated with lapses, so far as individual receptive hearing was concerned. Apart from this, however, everything was smoothness itself.

Louisville was bathed in rain on the evening of Tuesday, and the dripping continued about all through the first day of the meeting, but no one seemed to be dispirited thereby. In fact, many welcomed it, for the Spring so far in the South this season was of the dry order, and when it comes to a choosing between dust and mud, it is not altogether odds on that the latter is not preferable. One can avoid mud, but dust is ever on the wing.

President Egner's gavel rapped to order a goodly assemblage, and no time was wasted in getting down to work when the hour for convening the sessions was at hand. Secretary Littleton, of course, has the routine of such things now so close to his finger ends that delay and trifling are not to be thought of, and thus the team of President and Secretary pulled together without laboring. In olden times possibly an hour or more would be absorbed in getting to the point which Mr. Egner reached in less than 10 minutes, and before the members had been fairly settled in their seats all were listening to the inaugural address.

The annual message to the Western gas men was in Mr. Egner's best style, and certainly the readers of the JOURNAL do not require any intimation that, even if the English is not his mother tongue, Egner can write in a style so clear and well knitted that what he puts on paper requires no translation. We were prepared for a finished, practical paper from him, but we must confess that we did not look for one that would be so broad in its range. In common with other gas engineers, whose contact with many of their brethren, mainly because of the advances made and opportunities afforded by our Associations, Mr. Egner has broadened in view and ripened in opinion in that held by him toward the past, present and future of the gas business. It is perforce our duty to accept the old conditions as we find them, but it is not our right by any means to hold that old conditions were *always* the best. And so, we think, Mr. Egner may well be put forward as a model of the gas engineer of to-day who is likely to advance the business that it is our bounden duty to uphold and to defend from the attacks of all-comers. As the address was given in full in our last issue, we make no doubt that it has been carefully read and thought over, for it certainly merits close and careful study. Over-capitalization is the curse of many an industry, but the majority of instances where we encounter it in the field of gas supply are, in our opinion, not so much identified with the rapid growth and development of cities as they are with "fool competition." Not that the majority of those who were frequently interested in the inception of these schemes were fools—on the contrary they were

of a different sort. No; the agitation by that class of a blind belief that competition is the life of trade, which undercurrent was well known and skillfully taken advantage of by the opposition gentry, is likely to have the credit for excessive gas capitalization. We would, too, call attention to the instance of this that is afforded in the very city, the engineering management of whose gas supply is in the capable hands of Mr. Egner and his aides. St. Louis at divers times grants charters to opposition companies; in the end the companies combine—no matter how, or why—and what is the result? The "united Company" stag gers under a stock and bond load of $19,034,400! And the gas makers are supposed "in time" to be able to earn interest and dividends on that bundle of paper! Verily, the financiers of New York and St. Louis who made this apportionment ought to be proud of their achievements. Perhaps it was all for the benefit of the St. Louis gas consumers that the securities were piled up, and it might be that Mr. Egner remembered all this when preparing his address.

His references in respect to electric lighting are evidently framed on close observation of the signs of the times. Our electric lighting friends never fail to cackle when something seems to them to have fallen into their nests, but the straw in the latter keeps persistently bare just now. Incandescent electric lighting has made no advance in respect to the cheaper production thereof, in the last 3 years, unless it be a slight one in the charges for the lamps, and not a gas maker in the country but is satisfied that the great bulk of the artificial lighting field is his—apart from the kerosene end of the farm. Not in 10 years, manufacturers of gas apparatus tell us, have they been in receipt of orders equal in magnitude to those now on their books; and our item columns confirm that assertion.

Going back a moment, we can and do and have heartily supported the movement for State gas commissions as the measure that will kill over-capitalization and keep the gas director overfond of excessive dividends out of harm's way, and we are more than pleased to note that Mr. Egner still holds to that line of attack and defense.

But when one says that his address is even more than was anticipated, enough praise is given to it. It is in all respects an admirable paper.

The paper list suffered notably in the list of the absentees. Messrs. Chollar, Watts and K. M. Mitchell failed to put in an appearance, although the papers by the two last named were read to the convention. The papers, as a whole, were well put together, and more extended reference will be made to them in succeeding issues. The Standing Committee on Uniformity in Gas Company Accounts handed in a resume, which will be given in full later on, and the World's Fair Committee evidently have not been sleeping at their posts.

The attendance on the second day was very large, and the interest was well sustained. The weather was fine and the city was at its best. Thirty new members were added to the membership rolls, and Mr. Forrest E. Barker, of the Massachusetts Board of Gas and Electric Light Commissioners, was made an Honorary Member, much to his surprise, and greatly to the gratification of the members. The list of officers was given in our last—in fact "Three Stars'" correspondence of a week ago covered so much that was of interest that we now are at a loss to beat over the ground in quest of matter to report. The meeting as to its technical side was most enjoyable, and was fully up to the high standard set by the Western.

On the evening of the second day several of those in attendance, through the courtesy of Mr. Harry Bishop, of the Directorate of the Louisville Gas Company, enjoyed a delightfully pleasant visit at the Pendennis Club. Friday and Saturday were devoted to the trip to the Mammoth Cave, which lies in tortuous state in Edmondson county, at a point 99 miles from the Falls City. At 8 A. M. of Friday a special train, well provisioned, and under the immediate charge of Mr. A. H. Barret, of the Louisville Gas Company, and Mr. A. F. Callahan, of Dennis Long & Co., of Louisville—the Gas Company and the Dennis Long Company prepared this excursion at their own expense—with 188 guests (of whom 45 were of the gentler sex) on board, pulled out of the L. & N. depot, en route for the Cave. Weather more perfect could not have been, and a country more beautiful was an impossibility. A perfect railroad run of four hours brought the voyagers to their destination. A great, rambling old hostelry gave rest, shelter and "other things" to the party, after which the short route in the Cave was travelled over. It is useless to attempt to describe the wonders of this famed spot; they must be examined at first hand. Word picturing will not do at all. Back to the hotel was next in order, and such a glorious night was then to be the portion of all. Soft moonlight, grand woodland, emerald greensward, softened music—those who could not enjoy themselves as their fancy dictated, whether in dancing, meditation or meandering, were not of the party. A bracing night's rest fitted all for the journey over the long route on Saturday morning, which was as complete in its success as that of the previous day. The ladies especially seemed delighted with this novel outing, which was as perfect as it was unique. Shortly after 1 o'clock the voyagers once more took their seats in the special train, and at 5 P. M. Louisville was reached, when good-bye was said—not, however, before three rousing cheers had been given for Mr. Callahan and Mr. Barret, whose aptness as entertainers had been put to the most crucial test and found to answer every strain. And so ended a meeting that answered every purpose for which it had been called.

[Official Report.—Revised by the Secretary.—Continued from Page 743.]

FOURTEENTH ANNUAL MEETING OF THE WESTERN GAS ASSOCIATION.

Held at the Galt House, Louisville, Ky., May 20, 21 and 22, 1891.

First Day—Morning Session.

Committee on President's Address.

On motion of Mr. George T. Thompson the address was referred to the following committee for consideration and report: E. H. Jenkins, Columbus, Ga.; Wm. Steinwedell, Quincy, Ills.; I. S. Post, Chattanooga, Tenn.; George T. Murdock, Elkhart, Ind.; A. T. Averill, Cedar Rapids, Ia.

An Invitation from the Committee of Arrangements.

Mr. Callahan, of Dennis Long & Co., was introduced by the President, and spoke as follows:

Mr. President and Members of the Western Gas Association: As you are all doubtless already informed that the Louisville Gas Company and Dennis Long & Co. have jointly tendered to the members of the Association an excursion to Mammoth Cave, we thought it would be better perhaps to explain here at the outset of the meeting some of the details of that excursion, in order that there may be no misunderstanding, and that we may have as many of you as possible with us on the excursion. I will say at the start that of course all of the associate members are included in the invitation. Someone wrote asking if the ladies were included. As the excursion was gotten up largely for them, we shall be very much disappointed if they do not all go. It seemed to us that as the excursion was arranged for Friday and Saturday, it would fit in very nicely with the business arrangements of the members, and there would be no business excuse for declining to go. We shall leave the depot (just back of the Galt House) on Friday morning at 8 o'clock. As there will be nothing in the way of banquets (or anything else, so far as we know) to keep you up late on Thursday night, we hope you will all be able to be at the depot promptly. We get to the Cave at about 11 o'clock; but as we have a special train we can regulate our movements somewhat to suit ourselves. We shall take what is called the "short route" in the Cave immediately after lunch, and will get out of the Cave in time for supper. We shall have some music there on Friday night, and those who do not feel too tired can dance. On Saturday morning we will take the "long route," and we ought to get out of the Cave by 1 o'clock, and be back to Louisville by 5 o'clock—in ample time to catch the trains leaving Louisville in the evening; and, starting at that time, I suppose there are very few of you who live at such a distance that you cannot reach home by Monday morning. We want all the members to feel that we not only want them to go with us, but that we shall be much disappointed if they do not go; and I want to impress upon you that there will be nothing inconvenient to yourselves in going. In making the trip it will not be advisable to take any trunks with you. The gentlemen had better, perhaps, wear a rough suit of clothes, and the ladies ought to take some kind of warm apparel. It is so dark in the Cave that they will not need to pay much attention to dressing. The souvenir invitations which have been prepared are now ready for distribution, except that we want to put the names on the envelopes, and there has been no way of getting the names until the members came here. Therefore, during the day I will ask you to register, not only your own names, but also the names of any parties you may have with you, so that we may be able to make up a complete list of those who will accept the invitation. And if any of you should happen not to receive a formal invitation, through our oversight or your neglect to register, we want you to understand that you are none the less invited. We want you all—active members, associate members, and all the ladies, certainly—to go with us. I shall be glad to answer any questions about the details of the trip which I have not explained. I have been asked if it would be practicable for some of the party to return to this city on Friday night. I do not think it would be practicable for any to get back early enough to take the regular trains leaving here on Friday night. I may add that, like a theatrical party, we shall take our refreshments with us, and shall have a supply of ice water, lemonade, and all that sort of thing, in the baggage car. I have been asked if any of the party who did not care to stay to take the long route, could take the short route on Friday afternoon and come back here on Saturday morning. I am almost certain that that can be arranged, but I will ascertain as to that and put our President in possession of that information before the convention assembles this afternoon.

But I think all who go will have such a good time they will wish to stay until the finish. (Applause.)

ANNOUNCING THE COMMITTEES.

The President—The Committees will now be announced. As you know, the Committee of Arrangements for this meeting consists of A. H. Barret, Louisville, Ky.; James Somerville, Indianapolis, Ind.; and George H. Wells, Nashville, Tenn.

Committee on Receiving and Introducing Members and Visitors.—A. E. Boardman, Macon, Ga.; C. S. Knight, Fort Wayne, Ind.; James Ferrier, Eufaula, Ala.; Henry Pratt, Chicago, Ills.; and James Montgomery, Sedalia, Mo.

Committee on Nomination of Officers.—T. G. Lansden, Washington, D. C.; John Gimper, Leavenworth, Kan.; Eugene Printz, Zanesville, Ohio; George A. Yuille, Chicago, Ills.; and T. Bauer, Fort Scott, Kan.

Committee on Place of Holding Fifteenth Annual Meeting.—Isaac C. Baxter, Detroit, Mich.; Irvin Butterworth, Columbus, Ohio; J. W. Stratton, Valparaiso, Ind.; J. S. Ambrose, Springfield, Mo.; and R. H. Canby, Bellefontaine, Ohio.

Committee on Resolutions.—Edward Lindsley, Cleveland, Ohio; J. W. Dunbar, New Albany, Ind.; Z. T. F. Runner, Freeport, Ills.; G. T. Thompson, St. Louis, Mo.; and E. G. Pratt, Des Moines, Iowa.

READING OF PAPERS.

The President—As none of the Committees are yet ready to report, we will pass that order of business and proceed with the reading of the papers.

Mr. J. W. Dunbar, of New Albany, Ind., read his paper

ON THE PRACTICAL EFFICIENCY OF A SEMI-REGENERATIVE FURNACE.

In presenting a paper to this Association on the practical results to be obtained from benches of the semi-regenerative style of furnaces, the writer finds himself unable to cope with that part of the subject pertaining to the analysis of the gases produced in furnaces, and from such an analysis to direct either the members of this Association, or himself, to the construction of furnaces which, in any way, would be an improvement upon those now used. Nor has he any information to impart, except that which was gained by observation and practical experience; in short, he has nothing but practical experience to give. But as we, in the last several meetings of this Association, have had very exhaustive treatises on kindred subjects pertaining to relative values of gases, and their theoretical values, etc., and nothing of the practical operation of retort furnaces, the subject may be of value.

There are three kinds of furnaces for the heating of retorts for the carbonization of coal, viz: The direct or coke-firing furnace; the regenerative, and half-depth or semi-regenerative.

Direct, or coke-firing, furnaces are the oldest and most generally adopted. Nearly all small works still adhere to them. In these furnaces we have at times very imperfect combustion. At other times, a vast amount of surplus air is admitted into the furnace, and there being no carbon to unite with the oxygen of the air, the oxygen and nitrogen of air are heated to the detriment of the retorts. The result is comparatively a poor heat at the expense of a large consumption of fuel. Frequent clinkering and firing with cold coke are required, which, with shallow depth of furnace, cause great variation in the heat of retorts, and as nothing it so detrimental to a bench, we have short-lived, large coke-consuming furnaces and unsatisfactory results.

The regenerative furnace is, theoretically, the most economical to operate, but most costly in construction; being double that of the half-depth regenerative. In it all the waste and heated gases are used to heat the air for primary and secondary combustion, thereby giving back to the bench heat which would otherwise go to waste. The furnace affords in itself no direct heat to retorts, but is productive of carbonic oxide, which gas is consumed above the furnace and around the retorts, by means of secondary air supply.

This style of furnace is somewhat complicated and requires for its successful operation an almost scientific knowledge, that an ordinary gas superintendent does not possess. Then again, faultless construction is required, as any leaks in flues, caused by expansion or contraction in heating up and letting down a bench, will, if sufficient in number, render the bench valueless. On the whole, they are not practical for small works sending out less than 200,000 cubic feet a day.

In the semi or half-depth regenerative style of furnace, we have one cheap, simple in construction, easy to operate and to control, requiring less labor and attention than either the direct-firing coke furnaces or regenerative, and best meeting the requirements of small gas works. In them we adopt many of the best qualities of the regenerative, leaving out the expensive construction. They can, in most cases, be applied to exisiting arches and constructed, for a bench of 3's, at an additional cost of $75, and in a bench of 6's at $125. The furnace differs but little from the direct-firing furnace, except in area. In most cases they give direct heat to the retorts, as well as that due to secondary combustion, They may be constructed to heat air for primary supply, as well as for secondary. My experience, however, in heating the primary supply, has not been satisfactory. My belief is, that to have a furnace for the regeneration of carbonic oxide to be consumed by secondary combustion, we must have a completely constructed regenerative furnace. Still, air flues of sufficient dimensions to heat the primary air supply may be used to advantage. But with me, as our furnace was constructed, I found them comparatively useless, so far as being able to obtain sufficient heat for the retorts. During summer consumption, when no more than 42,000 or 45,000 cubic feet per day were required, it was a success, with 28 to 30 per cent. of coke produced.

The first requisite for the economical operation of a furnace is a slow draught, so regulated that when top plug is removed from front wall, the flame will slightly extend from it. By this slow movement, the air of secondary supply and carbonic oxide, produced by furnace, will more thoroughly intermingle and unite with each other, thereby retaining to the bench a great amonnt of the benefit due to secondary combustion. Dampers should be arranged in flues to govern draught. The furnace requires clinkering once from 4 to 7 days, during which time all dampers should be closed to prevent cooling of retorts. When steam is used, the clinker is soft and easy to remove.

The grate bars require to be shaken about once every four hours, to remove the accumulated ashes. This prevents clinkering up in furnace, where it would be hard to remove. The amount of secondary air supply must, according to requirements of the furnace, be decided upon by local conditions. No approximation can be given that would apply to all cases. The secondary flues should have as many winding feet as possible, so as to absorb the greatest practical amount of heat from the outgoing flues.

The second very essential requirement to a furnace is steam, and should be obtained from evaporation from ash pan, and also from a steam pipe extending around the wall, just under the grate bars. The pipe should have $\frac{1}{16}$ inch holes, about 8 inches apart. Steam is productive of economy in labor and fuel, as with its proper supply the clinker is kept soft and easily removed. Without its use we could practically obtain no heat, on account of furnace being entirely obstructed by clinker. Practically, it is a saver of fuel, althoguh theoretically it is not. It enters furnace at, say 212° as steam, and leaves, as steam, anywhere between 500 and 1,000°, and consequently has absorbed from bench just so much heat. This would certainly be a detriment if it did not transfer heat from a point where it is of no value to a point where it is a benefit. The introduction of steam, by its decomposition into oxygen and hydrogen, has the effect of decreasing the intensity of combustion. But it is at a point at which intensity of combustion is of no practical value, but a great detriment. The gases resulting from decomposition again combine, after leaving furnace, giving to the retorts the benefit of their combustion. Steam prolongs the life of the furnace, in preventing it from burning out.

The great benefit obtained by the firing of hot coke is, I believe, recognized by all. By its use we give to the bench just the amount of heat required to heat cold coke up to the temperature of hot coke used. It should be drawn by means of a chute direct from retort into furnace without any cooling.

In the care of retorts depends much the success of results obtained, whatever kind of furnace is used. They should be scraped at least three times a week, to prevent the accumulation of carbon, which should be removed with steam at least once every two months. It will then require but a few hours for its removal, and is accomplished with but little detriment to retorts. In charging retorts, but one should be opened at a time. The increased results obtained by this are more than one would suppose.

With benches of 6's, half-depth regenerative furnaces, a continuous production of over 10,000 cubic feet per retort may be maintained on a consumption of less than one-third of coke produced. My average charges in four retorts, 15 inches by 26 inches by 9 feet, to a bench of 6's, are 375 pounds every four hours, and in remaining two retorts, 14 inches by 22 inches by 9 feet, charges averaging 325 pounds are burnt. During times when there has been a demand, these have been increased to 400 pounds for the 15 inches by 26 inches by 9 feet, and 350 for the 14 inches by 22 inches by 9 feet, without any detriment to heat of retorts. The coke from no more than two bottom retorts is required to furnish fuel for furnace, and they sometimes are not needed. During the past

autumn and winter, when our bench of 6's was not equal to the demand, a bench of 3's was brought into service. But as there never has been a demand for the maximum production of the two benches, excepting one short period, I am unable to show a continuous average, month after month, of as high a production per retort as 10,000 cubic feet. It has been obtained, however, from the 6's. In running the 3's we averaged 6-hour charges of 300 pounds each, always keeping the bench of 6's up to its maximum production.

In regular running of furnaces, about 31½ per cent. of coke produced is required. Our monthly average is greater than this, for the reason that our bench of 3's, which has been started up and let down about 40 times, requires in the frequent starting up considerable coke, and as it is productive in this time of no coke, 60 per cent. of coke produced from the bench of 6's is required for the two furnaces, and hence our percentage of coke used is increased over the amount required.

Our holder capacity is 48,000 cubic feet, with a maximum consumption of gas varying between 60,000 and 90,000 cubic feet per 24 hours. This variation in consumption may occur in a period of 48 hours, for the reason that our street lamps are required to be lighted all night when the moon is obscured by clouds. This uncertainty of consumption, with small holder capacity, has required us, for as long a time as a week, to keep a slow fire under the bench of 3's without charging a single retort, during which time our consumption of coke is anywhere between 40 and 50 per cent. of amount produced.

For these reasons my monthly averages show less than 10,000 cubic feet per retort, and more than an average of 31½ per cent. of coke. So that the results given below are not to be taken as a criterion of the economical operation of half-depth furnaces, but may illustrate what they are capable of doing. I submit the following as results obtained last winter:

	Gas Produced.	No. Retorts.	Average Yield per Retort.	Yield per Pound.	Per Cent. Coke Used.
Sept., 1890.	1,691,000	180	9,395	4.97	33⅓
Oct., 1890..	2,064,000	228	9,052	4.95	38
Nov., 1890.	2,057,000	236	8,716	4.80	34.9
Dec., 1890..	2,422,000	246	9,846	4.86	37
Jan., 1891..	2,325,000	251½	9,245	4.80	37.6
Feb., 1891..	2,029,000	225	9,018	4.89	36.7
March, 1891	2,114,000	224	9,437	4.74	39
April, 1891.	1,645,000	180	9,139	4.89	34

It will be seen that in September we operated but one bench of 6's, or 180 retorts in all, our consumption of coke being 33⅓ per cent. We could not run it up to its maximum production during the light of moon, as only 40,000 cubic feet of gas were required per 24 hours, and we had seven continuous days in which our production averaged from necessity but 7,000 cubic feet per retort, which was a factor in pulling down our yield per retort to 9,395 cubic feet. Our experience in April was a similar one. Our average daily production per retort for first 15 days of April was 10,255 cubic feet, or 61,530 cubic feet per bench of 6's.

In order to show what may be accomplished when a demand is made for gas, I submit the following results obtained December, 1890, with one bench of 6's and 3's:

Gas Produced.	No. Retorts.	Yield per Retort.	Lbs. Coal Carbonized.	Yield per lb.
December 13, 92,000	9	10,111	18,150	5.06
" 14, 90,000	9	10,000	18,525	4.87
" 15, 93,000	9	10,333	19,350	4.81
" 16, 90,000	9	10,000	18,225	4.94
" 17, 90,000	9	10,000	18,600	4.84
" 18, 97,000	9	10,777	19,350	5.01
" 19, 91,000	9	10,111	18,375	4.95
" 20, 99,000	9	11,000	19,750	5.01
" 21, 100,000	9	11,111	20,250	4.94

This covered the period of our largest sendout, and consequently our greatest production. Since February, we have used 3 per cent. of cannel, previous to which time we used no enricher.

The great objection to high heats, due to half-depth regenerative furnaces, is stopped stand-pipes. This nuisance with us at times has been great. A small stream of water trickling down inside of pipe helps to decrease stoppages.

When settings become old, the draught sometimes is not sufficient. This may be overcome by inserting into outgoing flues a small steam blower, in the shape of a ½-inch pipe, with an opening from $\frac{1}{16}$ to ¼-inch, according to requirement. By this means the yields may be increased.

In gas works, where boilers are conveniently located to benches in retort house, the waste heat from half-depth furnaces may be utilized to make all steam required at works. I have so utilized it for eight years, during which time I have not used, except during repairs, any fuel for boiler. Were I to give the coke account of bench credit for amount saved in fuel to boiler, I think that half-depth regenerative furnaces would compare favorably with the regenerative furnace in durability, production per bench and per cent. of coke consumed, with a very much less cost of construction.

Discussion.

The President—You have heard an interesting paper, and I have no doubt Mr. Dunbar is ready to answer any questions which members may put to him.

Mr. I. Butterworth—I would like to ask Mr. Dunbar what coal he used in his trial to get these results.

Mr. Dunbar—We used Pittsburgh coal. That is about the only answer I can give. We supposed we were getting the best Pittsburgh coal.

The President—I will ask Mr. Dunbar as to his flues—whether they are vertical or horizontal.

Mr. Dunbar—They are horizontal.

The President—Then they could be easily got at to be cleaned?

Mr. Dunbar—Yes.

Mr. Burns—What setting of half-depth regenerative furnace do you use?

Mr. Dunbar—We have the Laclede and the Parker-Russell.

Mr. Fitz—How far is the boiler from the bench?

Mr. Dunbar—It is situated immediately at the end of the stack of benches. Next to that is a bench of threes, and following is a bench of sixes. The draft travels from the bench of sixes probably 10 feet to reach the boiler.

Mr. I. Butterworth—Can the waste heat pass from under the boiler back to the flue?

Mr. Dunbar—It comes up under the boiler and reaches the latter the same way that the fire under the grate bars does, then passes back and up through the flue to the stack.

The President—I have seen this heating of the boiler by the waste heat of the retort furnace, and it seemed sometimes to give a little trouble. There seemed to be some difficulty in keeping up the steam. I would ask Mr. Dunbar if he had any such difficulty.

Mr. Dunbar—Sometimes, in running 8-hour charges, the small amount of heat from the boiler is scarcely sufficient; but that can be obviated by putting wood into the fire and closing it up, and taking a little air in at the bottom—probably putting in as much as 8 cubic feet of wood, and letting it remain there. It will answer for 24 hours or so. But it is rarely that we have to resort to anything of the kind, and only when making 8-hour charges. In the winter time, when on the benches of sixes and threes, the amount of steam obtained is much more than that required.

Mr. Jenkins—How do you regulate the matter of an excessive amount of steam?

Mr. Dunbar—Each bench has a stack separately built, and in each stack we have a damper; and by that damper we let the heat which we do not require for the boiler go up the stack.

Mr. Tracy—What sort of boiler do you use—an upright or a horizontal?

Mr. Dunbar—We have tubular horizontal boilers.

Mr. Ferrier—How deep?

Mr. Dunbar—At present I have a flue running all along the stack, behind, and run it to the boiler. Before I had this rear flue I ran it over the top of the arch. At present I have it running directly behind the stack to the boiler.

Mr. Fitz—How is the boiler set—on a level or above?

Mr. Dunbar—It is set on the floor, just as you would build any boiler. It is not elevated at all.

Mr. Turner—What is the height of the stack?

Mr. Dunbar—About 40 feet.

Mr. Turner—That helps the draft considerably.

Mr. Dunbar—We formerly let the draft go up behind. Of course, a large stack is necessary in carrying the draft so far.

Mr. Turner—That helps your benches at the same time.

Mr. Dunbar—I presume it does.

Mr. Jenkins—This paper is of interest to most of us, and I think we are under obligations to Mr. Dunbar for having put the matter in such a light that we can readily understand it. I move that we give him a hearty vote of thanks.

(Carried.)

The Association then took a recess until 2 o'clock P.M.

FIRST DAY—AFTERNOON SESSION.

The Association met at 2 P.M., and

Mr. John Gimper, of Leavenworth, Kan., was called upon to read his paper in response to the question

DOES IT PAY TO USE INCLINED RETORTS IN SMALL GAS WORKS?

In a paper read before the American Gas Light Association, at Savannah, last October, by our worthy President, on the subject of inclined retorts, he did me the honor to say: "It is not unlikely but what we shall soon get some valuable and reliable information on the subject of whether or not it will pay to run only one bench of inclined retorts, where only one or two benches are required." And in a recent letter he again urged the subject upon me. I offer this, therefore, as an excuse for again appearing before you with a paper.

Mr. Egner says the information to be given by me will be valuable and reliable. No doubt he, and all of you, will expect that, but I fear as to the value I shall fall short of your expectations—as to the reliability of what I will furnish you may depend upon.

"Does it pay?" is the all-absorbing question in every business. All undertakings which are projected are considered from that standpoint alone. When a change is proposed we are confronted by the same question.

Does it pay to deviate from the old trodden path? This question was asked me years ago, when I first introduced regenerative benches into small gas works, and to day I am asked does it pay to put inclined retorts in small gas works. My answer in a general term and upon general principles is "yes" It always pays to take a step in the direction of progress. By so doing we will often meet with difficulties, and we may make mistakes, which will prevent immediate return payments, but by sticking to it and correcting the errors it will pay in the end.

Before introducing the inclined retort system at our Springfield works I went to St. Louis to investigate the French bench once more, and in talking with Mr. Taylor, who was then in charge, with a view of introducing it into a small works, I was given no encouragement; on the contrary, he disapproved of it on the ground that the labor involved in charging with the wagonettes was too great, it requiring two men.

My proposed plan for handling and charging the coal was quite different, and, after explaining it to him, he agreed that it was an improvement over their methods and would do away with his objections.

I also noticed whenever a retort was opened, previous to drawing the coke, considerable tar would come from its mouthpiece. The question, therefore, occurred to me, could not this tar be prevented by taking off the gas at the upper instead of at the lower end of the retort, and by so doing the tarry vapors would have to pass through the upper and hottest part of the retort, thence through the less hot charging neck, and thus become fixed into gas and increasing its yield.

When I asked the question why the gas was taken off at the lower end no reason was assigned, except that that was the way it came from France. I, therefore, concluded it was the old, trodden way, and I would deviate from it. With these so-called improvements well fixed in my mind, I gave the order for the first inclined bench to be built in the United States.

After starting the bench I found that my reasoning was quite correct. I could handle the coal and charge the bench with one man, and the tar did not appear at the mouthpiece, and the gas ascended to the upper end, where it was taken off, and the tarry vapors were converted into a fixed gas, only a dry powder being left behind in the connections between retort and hydraulic main, which, with the provisions for cleaning the pipes, was easily removed. These conditions, however, did not remain very long. Soon the heats varied, and, instead of dry powder, pitch made its appearance, which was not so easily cleaned, and then the trouble commenced and continued to such an extent that it became apparent that this manner of taking off gas had to be abandoned and I would have to go back to the old-trodden path. It is needless to say that this deviation did not pay, except in so far as you may take heed of it and profit by my experience, and then it will pay you; but pay it does in the end.

As soon as I could spare the bench it was let down, the change made, and after firing up again our troubles were at an end.

From Mr. Egner's phraseology it must be assumed that it does pay in large works to use inclined retorts, but he questions it in small ones. I am willing to admit that not every appliance will pay to be used in small works. For instance, I should not think of introducing a steam stoker, but I do contend that what is a saving and benefit on a large scale is proportionately so on a small one. If that were not true we would have no small gas works in successful operation to-day. The benefits which Mr. Egner receives on eight benches I can receive in the same ratio on one bench, as the cost is per 1,000 feet of gas produced in our works as against his cost. The advantages which one system or process possesses over another are the factors which are to be taken into account to recommend it for its adoption. Against this must be considered first cost, operating expense, depreciation or repairs.

The first cost of an inclined bench is not prohibitory in my opinion for a small works. Our bench being the first one built has no doubt cost more than future ones will. Of this I am creditably informed, and will, therefore, leave this part of the subject with you and the manufacturer to discuss. As to operating expenses, the odds are very much in favor of the inclined retort, of which I will make reference further on.

In regard to depreciation or repairs I can see no reason, that, with careful construction, there need be any more than in any other system—to the contrary, there is less wear from tools. The advantages which the inclined system possesses over the horizontal one may be summed up as follows:

First. The capacity of the inclined retort is much greater. It is generally admitted that a 9, to 9 feet 6 inch horizontal retort is as long as can well be handled. While the length of an inclined retort is only limited by the heating capacity of the furnace.

Second. The most perfect distribution of the coal in the retort.

Third. There is a large saving in labor. The charging of a retort takes only a fraction of a minute, hence not only saving labor but gas.

Fourth. The drawing of the coke is also done in much less time, and with less hard work. The coke coming from the retorts is in larger lumps, and while we get no more for it, is more salable by reason of its looks and less breeze.

Fifth. The carbon is easier removed, and can nearly all be saved.

Since the introduction of the regenerative furnaces much of the hard and exhaustive labor in the retort house has been reduced to a minimum, while yet the most laborious part still remains in its primitive condition. By the inclined system the coal is elevated by machinery and the whole charge is made in about the same time a scoop-full is put in by the old way, thus, undoubtedly, saving the stoker much hard work. It is true they are still exposed to heat, but only momentarily, so to speak. Looking at the inclined system from a humane standpoint, leaving out of the question the gain in dollars and cents, we can well afford to even spend some money to lighten the burden of our faithful stokers, who contribute so much to our success.

The practical lesson taught to me is that when we tread upon unknown paths we will meet with difficulties, but by perseverance we will overcome them, and that new methods do not always do away with old ones altogether.

Discussion.

The President—You have heard an excellent paper, and the subject is one which ought to be full of interest to practical gas men. It is now before you for discussion.

Mr. Dunbar—In the operation of one bench of inclined retorts where does the saving of labor come in over one bench constructed the other way? Does your stoker do all the charging, and drawing, and hoisting of coal by machinery?

Mr. Gimper—Yes; the coal is hoisted up into an overhead hopper, from which the charging bucket is filled, and the retorts are charged individually from that. Of course a good deal of the saving of labor depends upon the size of the coal store overhead, so that you can elevate all your coal required for a whole day, at a convenient season. Then, when the charging time comes, the men can draw from that and charge the retorts. I found when everything was in good working order one man could attend to a bench of five retorts very well. I think where a certain amount of gas has to be made, and it requires a certain number of men, there may not be quite so much saving as where you can do it with one man, who could not, perhaps, do that work so well if he had other appliances, or by the old method of making gas, as with the machine he would be able to do it. In taking off the gas from the top of the retorts we experienced a good deal of difficulty and trouble, and, therefore, we could not work as economically as when everything was in order; but about a week before I left we got our bench changed, and now, so far as I know, it is working satisfactorily, and so that we do reduce the labor.

Mr. Odiorne—I would like you to explain one thing. You say that there is a saving of labor, and that one man attends to a bench of fives. In my works one man attends to a bench of six retorts. Where, therefore, is the saving of labor? Is it because you can employ unskilled men, and pay smaller wages?

Mr. Gimper—There is quite a difference in the men also.

Mr. Odiorne—I did not know but that the saving in labor might be

because any laborer could do this work, while with an ordinary setting a man of some skill is required to charge the retorts, and because that we have to pay them $2 per day.

Mr. Gimper—The charging in the inclined system is such that any one who is able to pull a lever and drop the coal can charge the retorts. But everyone can not charge a horizontal retort.

Mr. Odiorne—Then you pay ordinary laborers' wages only?

Mr. Gimper—We are paying our stokers the same that we would pay for charging horizontal retorts.

Mr. Odiorne—If that is the case I do not see where the saving of labor comes in.

Mr. Gimper—It is because fewer men are required. The men in our works at Leavenworth can do more work than those working at the plant at Springfield, Mo. And besides that, I find the men who know how to properly charge a horizontal retort are comparatively few in number; whereas any man with common sense can charge an inclined retort. This is rather an experiment with us, and we have got to find out a good many things yet. I don't consider we are yet up to the point that we hope and expect to reach. It requires time and patience to attain the best results.

Mr. Dunbar—How much is the additional cost of the system of inclined retorts, including the hoisting apparatus; and does it not also want a newly constructed retort house, as retort houses for small gas works now exist?

Mr. Gimper—The bench can be put up in the old retort houses. If we had built a new retort house we should have constructed it differently and more conveniently. As to the cost. As I say in my paper our bench has undoubtedly cost more than we would now have to pay, because of its being the first one built. The hoisting apparatus is not a very expensive thing, as we must all have steam power and an engine. We elevate the coal with buckets on a belt; and we put the hopper for storing the coal on top of the roof, at the highest point. The extra cost will depend a good deal upon local conditions; upon just how you are fixed, and what you have already. But for an inclined bench to be charged in the way we are charging, you should have more overhead room than you have in the retort house that you speak of.

Mr. Jenkins—How much more gas per mouthpiece can you make with an inclined retort than with an ordinary bench?

Mr. Gimper—That depends upon the size of the retort.

Mr. Jenkins—Take the bench that you have in operation or one of the ordinary size.

Mr. Gimper—When I left we had not quite reached that point; but I had a letter yesterday which said that the heats were gaining, and that they were making more gas with less coal than they did when I left.

Mr. Jenkins—That would solve to a considerable extent the labor question—if one man can make 40,000 feet per day, and another but 35,000.

Mr. Gimper—As I have said, the size of the retort depends upon other considerations, and is limited only by the conveniences one has for making the heat; and a good deal of heat is the principal thing in all gas works. I do not think that our construction is perfect as yet. I think we should make some changes if we had to rebuild. The distribution of heat is naturally somewhat different in this construction from what it is in the horizontal, because of the shape of the arch.

Mr. Lansden—I am somewhat interested in this question, and would like to ask your opinion of the inclined system constructed according to the original drawings as they were furnished from France. As I understand it, the bench which you have put up is a modification of the original Coze drawing. What is your opinion with regard to the Coze system, constructed according to the drawings originally furnished from France, and which I am following in putting up my benches?

Mr. Gimper—I have not got the two drawings in my mind with sufficient clearness to compare them; but the principal change we made was taking off the gas from the upper end of the retort instead of from the lower end. There may also be some change in the construction of the furnace; but the principal change is that which I just stated.

Mr. Lansden—But that, of course, has nothing to do with the charging or discharging of the retorts. What I would like to know is whether the trouble which you and our worthy President had was or was not due to that change in the way of taking the gas off? Is it not your opinion that the proper way of taking the gas off is that shown in the original drawings of the Coze system—from the front end of the retort?

Mr. Gimper—That is the way I am taking it off now. I had to make that change because I experienced so much trouble in taking off from the upper end.

Mr. Lansden—Is it your opinion that one man will draw twice the number of retorts that he would in the old style?

Mr. Gimper—Yes.

Mr. Lansden—And charge twice the number?

Mr. Gimper—The retort is charged in the fraction of a minute. When we shut down our bench, a few weeks ago, we charged five retorts, for the first time, in seven minutes. We were just seven minutes in charging them all; and we had to draw coal from the hopper, after we had charged the first one, because there was only one distributing hopper, and so we had to draw our coal from that hopper for all the other four retorts. We were 7½ minutes by the watch in charging the five. The coke falls in a solid mass from the top to the bottom, and all that we have to do is to take a bar and break it up. But if your heats are not good the coke coming from the upper end of the retort will cause you trouble. If the coal is soft, or if there is fine coal with it, the tar sticks to it and does not distribute itself properly.

Mr. Boardman—Are the retorts which you are using contracted at the lower end, as I have seen in some of the drawings? If they are, don't you think you would have less trouble in discharging your coke, if they were like the ordinary retorts, of the same size right straight through?

Mr. Gimper—There would be no difficulty in discharging the retort on account of the contraction at the lower end. We could contract it 6 inches more and still there would be no difficulty at all, because we have to break the coke up right away from the beginning, and it always breaks up into small enough lumps to come out.

Mr. Boardman—Then you think there would be no advantage in having it the same size throughout?

Mr. Gimper—None at all. The first mouthpiece we had was the full size of the retort, and I liked that right well. The next we put in were contracted somewhat, but I find they are just as good. In fact I would rather have a little smaller make than the large make, for I think the wear and tear is less in the course of time.

Mr. Dell—You spoke about paying the same wages to men working on the inclined retorts that you were paying before. Suppose that you had nothing but inclined retorts—would you still pay the same wages?

Mr. Gimper—That is a question.

Mr. Dell—Don't you pay the same wages now merely because you are working the other style of benches in connection with the inclined?

Mr. Gimper—I do not believe in cutting retort men's wages down. I think they earn all they get, no matter what system they are working. (Applause.) I would not, on that account, recommend the inclined system.

Mr. Dell—I think that the mouthpiece you have at present is not contracted, but is exactly the size of the outline of the retort; for if the coal cakes in the retort in one large mass, and the retort is contracted in front, you could not get it out so easily.

Mr. Gimper—It has to be broken up in the retort before it comes out at the mouth.

Mr. Dell—But you say that it slides out in one large mass.

Mr. Gimper—No; it is in the retort in one large mass, but it has to be broken before it comes out.

Mr. Dell—The mouthpiece is the same size as the retort?

Mr. Gimper—Yes.

Mr. Odiorne—Do you get the same yield of tar per ton of coal with these inclined retorts?

Mr. Gimper—I have not made any estimate as to that. Having only lately run the inclined bench alone, we have not kept any record; but I do not believe there is any difference in that respect.

Mr. Odiorne—Do you not lose more when you open the lid?

Mr. Gimper—Very little more. That was the objection I saw to the outline or description of the system as printed in the French paper, and that I did not like—so much tar came from the mouthpiece. We do not have that trouble now, and we are using a different coal.

Mr. Landsen—If you were using rich coal you would probably have more tar in the mouthpiece than you have now. Is not that small accumulation of tar there a great benefit in freeing you from stopped stand-pipes?

Mr. Gimper—We have had no trouble from stopped stand-pipes.

Mr. Lansden—Is it not the fact that the presence of the small amount of tar that drops over the dam is what really prevents the stoppage of the stand-pipe.

Mr. Gimper—I have not thought of it in that way; but I am inclined to doubt it.

Mr. Lansden—In St. Louis, they tell me, they have had no stopped stand-pipes. If I am not right as to that the President will correct me. They also said they had no stopped stand-pipes in the old works, a fact that I attributed to the amount of soft tar that was in the mouthpiece.

Mr. Gimper—Possibly, that is so. I have had no trouble yet with stopped stand-pipes. The tar that comes out is of a pitchy nature.

Mr. Lansden—It is very limpid.

Mr. Gimper—When our heats are up it is almost like pitch, but you can handle it when cold. The original Coze bench has a plug or stop-cock underneath, but they told me the tar was so thick it would not run out, hence they abandoned that way, letting the tar out when they opened the lid.

Mr. Lansden—I saw the St. Louis inclined bench drawn several times during the last few years, and it seemed to me the tar was of the lightest sort that I ever saw coming from a bench. I think it is only generated from the few lumps of coal which fall over the dam, lying right inside of the cast iron mouthpiece. Once in St. Louis, when I saw the retort drawn, the tar was so very soft, that it spattered to a distance of 8 or 10 feet. In fact one had to stand a great way off to keep from getting "spattered."

The President—From my own experience with the inclined bench, if I were building a new retort house to day, or was putting in a new stack of benches, whether the works were small or large, I would put in the inclined retorts; but I would not put in the retorts (as ours are) back to back. I have also found that by taking the gas off in front I would overcome the difficulties that we had before. When I put those in I thought we would improve the operation of the bench by taking the gas from the top. I have heard Mr. Lansden criticized that—I don't know whether it is true or not—so I thought I would show him that he was wrong and we were right. However, I am always "willing to acknowledge the corn." We are running one bench like that now. We have some difficulty in keeping the heats up; but that has nothing to do with the inclined system. My belief is, if I were asked now to build a new retort house, and new benches entirely, I would put in the inclined retorts; but if I had an old house that could be used, I would figure a little before I would make a change.

Mr. Odiorne—You say if you were building new works you would put in inclined benches. But that refers to St. Louis. Would you recommend that in a small town, or for a small gas works?

The President—If I were building a new house, or a new stack, I would put in the inclined retorts every time, and for the reason that while one man might be required in either case, yet the work of distributing the coal would be so much simpler in this plan that one man could do it. If the only man you had in the place were taken sick, or it became necessary, from any other cause, the superintendent himself could do the work. The work of drawing is very easy, as also is that of charging, and the coal is distributed evenly and nicely. For that reason I recommend it to small works as well as to large ones.

Mr. Dunbar—I understand that in St. Louis you are rebuilding some benches and are not putting in the inclined system. If it is such a good thing why are you putting in the regenerative benches? (Applause.)

The President—We have arches for 20 benches, and also have the iron work for all those benches, and as everything is in good order, we can fill those arches very cheaply that way. If we were to build inclined benches we would have to throw away our iron work, and pull that stack down to the foundation, hence it would cost a great deal more. That is why we do not do it. I think in the long run it would pay. Again, there are other reasons, which I hardly think you would understand, that would further explain why we do not do it. It is a matter of present economy, that is all. If we had to rebuild entirely new we would put in the inclined retorts; and I repeat we would not put them back to back, as we have them there now.

Mr. Gimper—It seems to be the notion that people who have small gas works are afraid to take hold of the experiment. Now, the smallest gas works, started new, in a good location, would have a great advantage with the inclined system over the horizontal, and for this reason: If your ground is right you can put your coal shed on top of a hill, or on the highest ground, so that you will not have to elevate your coal at all, but can run it to the top of the retorts and drop it in. I would do that if I were to build new gas works. Many small gas works have to haul all the coal and hoist it up again; but instead of doing that why not put the coal shed up, drop the coal right into the retorts, and so save one man's work?

Mr. Somerville—I was shown a drawing the other day that will, I think, obviate the difficulty that seems to be troubling some of our members. It is a device of our friend, Mr. Mitchell, and I understand he has taken out a patent for it. He does away entirely with the cast iron, curved necks in the bench. The wall of the bench is flush with the end of the retorts. A platform is erected convenient for the man. There is an overhead movable hopper to which is attached a sheet iron, flexible feed pipe, which is also telescopic; it can move in every direction. When the retort is to be charged the hopper is brought to position, the feed pipe inserted, the valve opened, and the coal is deposited in the retort. You will see by this plan the heavy, expensive cast iron pipes are done away with, and also the trouble they seem to cause. Our friend, Gimper, is to be congratulated for what he has accomplished, and also for his willingness to come here and tell us about his failure. I think it is always as instructive to hear about failures as it is to hear about successes, and, I for one, feel under obligations to him for his excellent paper.

Mr. I. Butterworth—I would like to ask two questions. First, Mr. Egner said he would not build inclined retorts back to back; but he did not say why. Second, what is the advantage of having the inclined retort contracted at the lower end?

The President—I see no advantage in having the inclined retort contracted. If there was room for it I would not have it contracted. The reason I would not build them back to back is because I would build them something on the plan that Mr. Somerville has just spoken of, as it is easier then to charge them.

Mr. Lansden—As a general thing the ordinary width of a retort room would not permit of two rows of benches; but in a retort room 65 feet by 65 feet, you could put two rows of inclined retorts in the same room. Building them in that way you would require a wider retort room, as I understand it.

The President—That is right. That is the reason why I said if I were to build a new retort house I would do that; but for the present construction I would have only one set of benches in the same room, and not have them back to back.

Mr. Lindsley—If Mr. Somerville will pardon me, I will add just a word of description to the drawing he has given an account of, inasmuch as I have seen the drawings, and I think he referred to one of them, which was of some importance. The single pipe from the hopper to the retorts is a telescope pipe, so that it answers for all the retorts—it can be turned so as to act in any direction—so that that single pipe will answer for all levels, and will charge retorts which are back to back, and on either side of it, with equal facility. It is indeed a very ingenious appliance.

On motion of Mr. Lansden a vote of thanks was tendered to Mr. Gimper for his paper.

Mr. William Tracy, of Alton, Ills., read his paper on

AN ANNEX TO A SMALL GAS PLANT—WHAT IT SHOULD BE.

On the 19th of last December, finding myself in need of a stoker, I called on our worthy President for help. When he had complied with my request, he turned to me and said, "Mr. Tracy, I have you down for a paper at our next meeting." To say that I was surprised would be putting it mildly, and I can safely say when this paper is read the convention will be surprised that I was chosen. However, I consented, and it is the suggestion of our President that I should give my experience in running a small gas and electric light plant. The following is my experience:

July, 1889, I took charge of the Alton (Ills.) gas and electric light plant as Secretary and Superintendent, and I was indeed discouraged when I had investigated the plant. A brief resume of the conditions may lead to a better understanding of the difficulties overcome. The retort house was fitted up with two new arches, and filled with three retorts each, but capable of holding fives by crowding; stand-pipes 6 inches, and hydraulic main 20 inches by 20 inches, each section with openings for only three retorts, and one of our grandfather's seals attached to same. The condensing room had three annular condensers, washer and scrubber, and four purifiers, 6 feet by 8 feet. On putting my hand on the third or last condenser, I quickly withdrew it. I immediately procured a ladder to find the cause, and found the condensers had been converted into hot boxes. They were sealed both top and bottom in order to prevent the escape of the gas that was making. I next examined my purifiers, and found that I could put my finger through almost any of the covers. On entering the cellar I found the center seal leaking. Examining the holder I found this the only piece of machinery I could call all right. I had no street governor, no gauges, except that on meter and vacuum gauge on exhauster; a coal shed, which was not a good excuse for one, and which left some 50 or 60 tons of coal out-doors before the next spring came round. I had $150 in the bank to my credit, and was expected to make money in Alton from these works. My first move was to order four new covers for purifiers, to disconnect condensers, and substitute 6 inch pipe with spray of water on outside for condensers. My next, to build one arch in retort house capable of holding six retorts and filling same with five retorts. I ordered and set a Connelly governor, fitted works with gauges, built new coal shed; and, suffice it to say, at the end of first year, I had my works in a condition where I thought I could begin to make some money in Alton, although

in my estimation, far from perfect. The remodeling of works was all paid for from the earnings. I also added to works a hot tar scrubber in retort house. Finding no records of previous years I could form no estimate of what progress I was making, and could date the works back to July, 1889, only, as the initial point. In March, 1890, I asked Mr. Underwood, my President, to allow me to make a further reduction in the price of gas in Alton—a previous one being made when he bought the works. The price in March, 1890, was $3, with a discount of 75 cents per 1,000, if paid by 6th of month—gas stove rate $1.80 per 1,000 net. I asked to make the price $2.50, with a discount of 50 cents per 1,000, if paid by 6th of month, and also for gas stoves a discount of $1 per 1,000, from May 1st to October 31st. Having agreed to my proposition I started on a vigorous canvas for a gas stove trade. I had in use 15 stoves, and determined to materially increase this number. By fall I had placed 52 stoves, making 67 in use in Alton, consuming on an average 2,000 feet per month, this being an increase of 134,000 feet per month, which cost me the actual coal carbonized, less coke and tar sold.

You must not think when a stove is placed you are done with it. The stove must give satisfaction and be used economically. This I have always found the case, except where servant girls are employed. For example. I placed a stove in a gentleman's house on the 6th of the month. On the 31st the meter showed 8,700 feet of gas consumed. Deducting his usual bill for light would leave the stove to consume 5,700 feet. The gentleman came to me and said, "Mr. Tracy, I cannot stand that stove." I told him I would look into the matter. The next day, between the hours of 9 and 10 A. M., I called at the house, via the kitchen door. I found the stove in use for the purpose of ironing. There were four burners going, full head, and one iron on the stove. I told the girl I had come to remove the stove. She said, "Oh, no; I cannot do my work in this small kitchen without it." "Then why do you keep four burners going when one would answer your purpose just as well?" I asked. She thought it would make no difference, and sometimes she used the other burners. I told her she was throwing away 24 feet of gas an hour. I also gave her some other instructions in the economic use of stove, with the assurance that if meter showed such a bill another month I would be obliged to remove stove. I have never had occasion to call again at that house, and the bills are moderate. The fuel gas pays, and will be a very valuable annex to a small gas plant if properly pushed and looked after.

I found the works using native coal, the coke selling at from 3 cents to 4 cents per bushel, and some of the time hard to sell at that price. When any quantity was on hand it was taken to the electric light station and consumed. I could buy the best steam coal for $1.35 per ton, and felt sure should I use good coal my coke was worth more money. I, therefore, made a contract for 1,000 tons of Youghiogheny coal, and commenced saving up my coke. I was laughed at by our local coal dealers when I mentioned the sale of coke in Alton with good soft coal selling at 7 cents per bushel. But they found I was not to be laughed at. I put an advertisement of the coke in our daily papers. I also gave 20 or 30 loads of 8 or 9 bushels each away to those I thought would be customers, and before January, 1891, I was selling coke at 9 cents per bushel delivered, quite satisfactorily to myself and customers. In fact my coke pile is none too large at this time to suit me. I have had several overtures from our local coal dealers for my entire make of coke. I told them they should have made the offer before I had invested $215 in horse, wagon and harness for the purpose of selling coke. I shall also place a coke crusher this fall, which will add to the demand I have for coke at this time.

The substitution of good coal has paid. I have an increase in yield of gas, tar, coke, and quality of gas; and believe cheap coal will make dear gas. I am still in the coke business in spite of our local coal dealers, and find the substitution of good coal a valuable annex to my gas plant.

The superintendent of a small gas plant can never afford to lose his temper. It will not pay. In fact he must be so hardened to abuse that it is next to impossible for him to do so. I always make it a point to listen to all complaints, and give a certain amount of attention to all, although I may be well aware at the time there is no reasonable ground for same. As an illustration, I have one business man in Alton who will pay his bill, no matter how large it may be, without a kick, provided I can find him alone, but should I find six or eight customers in his place I can always look for a most vigorous kick. The larger the number present, the larger and longer the kick on the size of his gas bill. In fact, he will tell me he is paying more now with gas at $2 per 1,000 then when he paid the old company $4. Conditions are not changed—has same number of burners, etc. On one occasion, when I had received more than my share of abuse, with amount of bill in my pocket and a smile on my face, a gentleman walked out of the place with me, and said, "Tracy, could that man have said anything to have made you mad?" I replied: "Yes, he could have made me as mad as a March hare had he requested me to remove his meter. He is a good customer, and all his talk has no effect on me, and I have no doubt he gets considerable satisfaction in abusing me—and I have the satisfaction of getting his money promptly every month." You will find this a valuable annex to your gas plant, if followed in the proper spirit.

There is one other annex attached to my gas plant. I had almost forgotten the E. M. F. annex, and this will require all the M. F. you are possessed of in order to put $ on the right side of your balance sheet.

There are, no doubt, many annoyances connected with the gas business, but, "Oh, Lord! deliver me from the annoyances of an electric light plant."

My first Christmas in Alton should have been a pleasant one, and such was my expectation, on the evening of the 24th of December, 1889. At 6 P. M. my holder was well filled with gas, my electric annex making its usual revolutions per minute, when I started for home at peace with all mankind and well satisfied with myself. While eating my supper my telephone rang. I immediately looked out of the window, and, behold, total darkness! I went to the phone and was informed an armature had burned out. There is no doubt in my mind had the dynamo been placed in my hallway it would have revolved, for that portion of my house was full of E. M. F. Why an electric dynamo should show such meanness as to go out on special occasions and the darkest nights is beyond my comprehension. I do not wish to discourage those in charge of small gas plants from annexing this to their gas plant, but should such an annex be contemplated, see that the same is properly constructed from station to return wire at same. My electric annex was not properly built at Alton, but thrown in, and this, no doubt, accounts for my many annoyances and the heavy maintenance of same. We are at this time about to build an entirely new electric light station in Alton, and trust when it is completed some adequate return will be had for the time and attendance given same.

During last summer my thoughts were turned to one other annex which I confidently expect to see added to small gas plants. No doubt this thought was engendered by being obliged to pay $1 per 100 pounds for ice in Alton, and not being properly suppled at that price. In reading the proceedings of the Ohio Association I find I am not the only one who has thought in the same direction. Mr. Cantine, in his discussion on Mr. Osius' paper, stated that nature had about quit furnishing us ice, and if this state of things goes on it seems to me it will encourage the manufacture of that commodity in our smaller works.

I have thought that in strengthening ammoniacal liquor it could be run around a cold storage house, and that brought to a certain temperature, and the liquor when concentrated to proper strength turned to the purpose of ice making.

This may be a wild fantasy of the brain, and yet I trust some of our bright members will give us a paper on this subject, whether or not it is advisable for a gas company carbonizing 1,000 tons of coal per annum to manufacture ice and run a cold storage house. I expected to have some figures as to the amount of ammonia required to freeze 1 ton of ice, but this spring my business has been such that I have been unable to give the subject that attention it requires.

I have in my office a directory published by W. W. Goodwin & Co., of 1878, which shows two gas companies with an annex. If you will look over one of our late directories you will see how gas plant annexes are multiplying, and I confidently expect to see a charter asked for the following:

"Gas, Electric Light, Power, Fuel, Water, Cold Storage and Ice Company."

Discussion.

The President—There are many more small gas works in our country than large ones, and so I think this paper ought to receive some attention in the way of discussion.

Mr. Boardman—The suggestion contained in the paper with regard to the manufacture of ice is a very good one, but I am afraid it would not work out well. I manufactured ice (but not in connection with a gas company) for ten or twelve years, and found that one company will have about all it wants to do to take care of that part of the business without going into anything else. I believe in gas companies going into the lighting business; and even if we could sell coal oil for light I would do that. I hardly think it would pay to go into the ice manufacturing business. We had better make our ammonia into ammoniacal salts and sell it to people who make ammonia, letting the latter sell it to the ice manufacturer, and so help one another. We must not seek to own the earth. The people will be down on us if we attempt too much. The

Farmers' Alliance might run foul of us. I listened to Mr. Tracy's paper with a great deal of pleasure. I think the most valuable annex to a gas plant has been proved by that paper to be a good, live manager, and that was the best annex that was added to this particular plant. I move a hearty vote of thanks to the writer of the paper.

(Carried.)

The President—The next paper will be one written by Mr. Sylvester Watts, of St. Louis, Mo., on the

ECONOMIC RESULTS OF AN ELECTRIC LIGHT INVESTMENT, FROM THE STANDPOINT OF A GAS MAN WHO HAS NEVER INVESTED IN AN ELECTRIC LIGHT PLANT.

As Mr. Watts is not here I will ask Mr. Boardman to read the paper.

Mr. Boardman—Before reading this paper I want to state that I have not gone over these figures to verify them; and so, if any discussion comes up, I want to be dealt with very leniently.

Mr. Boardman then read as follows:

It has been observed by those who are familiar with the operation of electric lighting plants throughout the United States that the money invested in those plants, in the past eight years or more, has been almost a total loss. The first investors have been wiped out, and others with more capital and less experience have been induced to furnish funds for new-style machinery, the wear and tear on which will, in the next five years, bankrupt the present holders. Some of the so-called "parent companies" have survived by the demand for municipal street lighting and street railroad power, and through the money invested in their worthless lighting plants which they sold to timid managers of gas works.

Why should gas companies invest their money in electric lighting plants? Certainly not to do street arc lighting, the price of which has long ago been reduced to a non-paying basis by the competition with those unnatural "parent companies" which sold the original plants to the gas companies.

Then in regard to the incandescent electric lighting—"the rich man's light." Rich men, we all know, are very few, and proverbially economical, so that but little profit may be looked for from their lighting bills. The arc light for indoor lighting has about gone out of use, so that the incandescent electric is the only electric competitor with gas.

There is one item of cost, merely in the distribution, of incandescent electric lighting that will forever bar it from becoming economically a successful competitor with gas.

That item is the cost of renewing the lamps. The cost of the renewal of lamps alone is equal to adding 15 cents per 1,000 feet to the selling price of gas. One 16-candle power electric lamp, that will live 600 hours, will in that time give light equal to 3,000 feet of gas, burned through a common 5 foot burner. This electric lamp costs 45 cents, and lives only long enough to give a light equal to that given by 3,000 feet of gas; consequently the cost of renewing the lamp makes a difference of 15 cents per 1,000 feet in favor of gas. This 15 cents per 1,000 feet is the cost of replacing the lamps, and does not include the cost of the electric current.

The electricians tell us that they cannot expect to further reduce the cost of the current; that their machines are doing the work as cheaply as it possibly can be done with steam; and that to further reduce the cost of producing the electric current they must conjure up some process of getting the current, or power to produce the current, direct from the coal pile.

The coal pile is to be made to render up its power in some unknown, and therefore indescribable, manner. As long as the coal pile remains obstinate and refuses to comply with the wishes of the electrician, then the production of light with gas will continue to be, as it is at present, the most economical and most reliable manner of lighting. I will venture to say that if the gas companies would be willing to accept an annual profit of 6 per cent. on the actual cash value of their plants, they could reduce the selling price of gas to a point that would bankrupt all incandescent electric companies doing business within their territory.

In addition to its superior, economical lighting power, coal gas is the cheapest fuel gas for household purposes that has ever been discovered. It is always ready, can be eactly measured, is of unvarying quality, can be economically and safely delivered to the consumer, and during the greater part of the year, in the latitude where nine-tenths of the product is used, the heat given out by the burners for lighting purposes materially decreases the cost of heating houses. In the summer season the doors and windows being kept open, there is little inconvenience from heat of burners.

I herewith submit the following statements: The first showing comparative cost of producing 1,000,000 cubic feet of coal gas, and the cost of producing by incandescent electric lamps the same amount of light as the 1,000,000 feet of gas will produce with the common burner.

Coal Gas.

Labor for making 1,000,000 feet per month, three men.	$155.00
100 tons of best gas coal, at $4.25 a ton,	425.00
	$580.00

Less Value of Residuals, per Ton.

20 bushels coke, at 10 cents, ... $2.00	
12 gallons tar, at 6 cents, ... .72	
$2.72—100 tons, ...	$272.00
Net cost labor and material,	$308.00

Incandescent Electric Lighting.

Labor, three men per month,	$155.00
100 tons common coal, at $2.00,	200.00
	$355.00
Add renewal of lamps, 15 cents per 1,000,	150.00
	$505.00
Net cost of 1,000,000 feet of gas,	308.00
	$197.00

$197.00 difference, or 64 per cent. more than the cost of coal gas.

The following statement will show the comparative cost of material and labor for making 1,000,000 cubic feet of coal gas, and the cost of making 2,250,000 cubic feet of fuel water gas. The following statement is based on 1,000 feet of coal gas evaporating 591 pounds of water, as against 262 pounds of water with 1,000 feet of fuel water gas.

As coal gas will evaporate 2¼ times as much water as fuel water gas, it will require 2,250,000 feet of fuel water gas to evaporate as much water as 1,000,000 feet of coal gas.

Net cost of 1,000,000 cubic feet of coal gas, as per previous statement (coal and labor)	$308.00
To make 2,250,000 feet of fuel water gas, estimating 40,000 feet per ton of 2,000 pounds of anthracite coal.	
56¼ tons (2,000 pounds) at $6.00 per ton,	$337.50
Labor of two men, one month,	100.00
	437.50
Cost of coal gas,	308.00
	$129.50

Differenee of $129.50, or 42 per cent. more than cost of coal gas.

The above estimates are based on cost of gas coal and common fuel coal, and anthracite coal in places I am familiar with, and can be changed to suit different localities. My reason for estimating on a consumption of 1,000,000 cubic feet per month is, that 1,000,000 is about the average consumption in a greater number of our western cities.

Discussion.

The President—As Mr. Watts is not here to read his paper, or to support it, we can hardly expect to bother Mr. Boardman with the questions that perhaps some of us would like to put to Mr. Watts if he were here.

Mr. Lansden—It may seem to some that by refraining from a discussion of this paper we are putting ourselves on record as endorsing the views suggested by Mr. Watts. A great many people will criticise us if it is understood that we took his views for granted, and accepted his say-so without any discussion. Therefore, I would like it to appear that the reason why the paper is not discussed is because Mr. Watts is not present.

The thanks of the Association were voted to Mr. Watts for writing, and to Mr. Boardman for reading the paper.

(To be continued.)

Some of the Troubles with Steel Castings.

The *Railroad Gazette* calls attention to the fact that the causes of blowholes in steel castings are evidently numerous, if we are to believe all that is said about them. So far the list is about as follows:

(1) Piping action; that is a shrinkage of the metal in cooling, which causes it to be porous in the vicinity of the riser and in other thick places. (2) Gases given off by the cores. (3) Gases in the steel itself. (4) Atmospheric air carried in by the liquid steel during pouring.

To prevent piping, cores properly located seem to be adequate. The location of the gate has much to do with it. Castings which are otherwise the same will be found porous in one cast and solid in another,

where the location of the gate is different. The main remedy for blowholes due to gases and air seems to be lowering the melting point, or the use of hot molds. The addition of aluminum to reduce the melting point is, owing to its low price, now being made the subject of extensive experiment, both here and in England. Some railroad companies in England, notably the Lancashire and Yorkshire, have been very successful in making steel guide yokes, truck wheels and driving wheels by the use of a "physic," as it is called, principally of aluminum. At the present time two scientific societies in England are investigating this matter. Lowering the melting point has the effect of allowing the steel to remain fluid a sufficient time to enable the gases given off by the cores, or which may be in the steel, or the atmospheric air that may be carried into the mold by the liquid steel, to escape through the vents provided. Much success has been attained in keeping the steel in a fluid state while in the mold by using iron or steel molds coated with a thin layer of separating material, and cores as much as possible of iron, all of which are heated as high as practicable before the steel is poured.

It is evident from the progress recently made, and from the success already attained by some steel-casting companies in this country, that they will soon be able to produce sound steel castings of any form. In fact, there is little excuse now for steel castings so porous as to be objectionable for ordinary work. Of course, for receptacles to be kept tight under a heavy pressure, the small blowholes, which are at present almost unavoidable, will be found to be seriously objectionable; but so far as strength is concerned, these small blowholes matter but little. Stationary engine companies and makers of mining machinery are using large quantities of cast steel with numerous fine blowholes, and in their experience there seems to be no objection to such castings. In fact it has been stated by them that even with a considerable porosity the castings of steel are more satisfactory and reliable than those of iron.

Concrete in France and Italy.

Mr. T. Martin says that some substances, such as pozzuolana—a volcanic production found chiefly in Italy—have, in consequence apparently of silicate of alumina being predominant in their composition, the property of giving hydraulic qualities to the rich or non-hydraulic limes. It is of these that the concrete is made which has long been used for marine works on the shores of the Mediterranean; and, indeed, the piers at some of the Italian ports have been constructed almost entirely of hydraulic concrete. The author had lately an opportunity of examining, at Genoa, the extension of one of the moles of the harbor, the inner side of which has a vertical wall. The latter was in process of being constructed under water entirely of pozzuolana concrete, simply thrown into the sea from baskets carried on men's heads, a boarding confining it to the shape of the wall. In a short period it set quite hard, so as to enable the upper part of the wall, which is of stone, to be built upon it. The outer side of the mole, which had been previously made, was formed by stones deposited "a pierre perdue." Though the depth of the quay wall was not great, this shows the confidence which the Italian engineers have in concrete applied under water in a soft state. The piers of the new basin constructed by the Austrian Government at Pola, in Istria, are also formed, in a similar manner, of concrete confined between rows of timber piling.

But perhaps the most striking application on a large scale of pozzuolana concrete is in the great mole which protects the port of Algiers. To form the mole, blocks of beton of immense size, so as to be immovable by the force of the sea, were employed. Some of these were formed *in situ*, by pouring the concrete into large timber cases without bottoms, sunk in the sea in the line of the mole. Other blocks of a smaller size, though upwards of 30 tons in weight, were made on shore, being molded in strong wooden boxes. After the beton had set, the boxes were removed, and the blocks were launched into the sea to find their own level. The beton for the blocks *in situ* was composed of one part of rich lime in paste, two parts of pozzuolana, and four parts of broken stone; that for the blocks made on shore was formed of one part of lime in paste, one part of pozzuolana, one part of sand, and three parts of broken stone. These blocks set sufficiently hard in 24 hours to resist the shocks of heavy seas, and the mole now stands firmly, instead of being, as it was when formed, of loose blocks of stone in the time of the Moors, nearly destroyed every winter.

The French engineers have shown great boldness and skill in the application of beton, as exemplified in the Pont de l'Alma over the Seine, the arches of which, as well as the piers, are formed of rubble concrete; in the new graving dock at Toulon, before alluded to; and in the formation or protection of breakwaters by enormous artificial blocks of beton, as carried out at Marseilles, Cherbourg, La Ciotat, Cette, Vendres, Cassis and Algiers. A short time ago, when the author inspected the mole or breakwater which encloses the harbor of Marseilles, he found the huge rectangular concrete blocks, weighing upwards of 20 tons each, by which its seaward side is protected on the "pierre perdue" principle, perfectly entire and sharp in their outline, though they have been exposed for many years to the action of the sea. Any one standing upon that mole, and witnessing in a gale the heavy seas breaking with tremendous force on these concrete masses and recoiling harmlessly, could have no doubt as to the efficiency of concrete as a constructive material.

Hydraulic concrete, to be effective, requires care and attention in its manipulation, and in the regulation of the proper proportions of its materials. Any failures must have arisen from inattention to these, or similar points, as there is ample experience to show that, when properly made, every confidence may be placed in its strength and durability. Even where stone is abundant, this material may be often employed with economy and advantage; but where stone cannot be obtained, the importance of being able to form an effective substitute out of materials of so little value, and so widely distributed, can hardly be overrated.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, May 9, 1891.

Gas Engine Manufacturers—Mr. Walter Grafton, on Standard Candles—Petroleum and its Uses—High Power Lamps on Hire.

A special feature at a recent "Engineers and Ironmongers" Exhibition, held in London, was the large variety of gas engines on view. In point of numbers these far eclipsed steam engines and all other motors together. Time was when the gas engine trade was practically in the hands of one firm, but this is no longer the case, as was instanced by the fact that the exhibition above named included the production of no less than eight different firms, and this is exclusive of at least four known makes of gas engines. That this branch of trade should find so much favor is, of course, a fact that is viewed with complacency by all interested in the sale of gas, as showing the demand that exists for this form of motor. Whereas the usual idea of a gas engine, up to within the last few years, was a machine of 1 or 2 and certainly not exceeding 4 horse power, it is now interesting to notice that all the makers include engines up to 10 horse power. Many of the engines have tube igniters, that is to say, a tube kept at igniting heat by an external flame, so that the charge does not come in actual contact with the flame. Some of the new makes aim at greater simplicity in construction, with a proportionate reduction of moving parts and of cost. No doubt the latter consideration is of great importance, as the high prices of these machines have greatly hindered their adoption. It is especially amongst small users of power, whose capital is usually limited, that we must look for the adoption of gas engines. The question of simplicity is scarcely less prominent. It would be well if the gas engine could be so arranged as to be completely within the grasp of an average machinist. At present this individual cannot do much more than fix the machine according to directions sent by the makers. If anything goes wrong he must lay by till someone comes from the manufactory to say what it is. With a diminished price, also, gas companies may see their way to the hiring out of these machines at a moderate rental. A largely increased introduction of small motors would mean competition from makers of water and producer gas generators, in respect to engines of 8-horse power and upwards, while petroleum engines would come in at the other end, for small engines. Small motors worked by electricity are entirely out of the running at the price of gas usual in England. Schemes for the distribution of power by the medium of water or air, should also be mentioned. A Hydraulic Power Company has been in successful operation in London for some years. So that if anything worth considering is to be done in the supply of gas for gas engines, the gas must be both cheap and good. Gas engines, by the way, are quite as sensitive to variations in the quality of the gas as the eyes of gas consumers. With a respectable gas engine consumption, one or two are sure to be running up to maximum power. Under such circumstances a reduction of say 10 per cent. in the quality of the gas causes the engines to stop.

One of the most interesting papers on the subject of photometry as practiced in gas works, that have been published of late years, is now appearing in the *Journal of Gas Lighting*. The author, Mr. Walter Grafton, has something to say in favor of the standard sperm candle, and this fact of itself commands attention, because it has now been the fashion for many years to abuse the candle as incorrigible in respect to accurate work, and to enlarge on the necessity for other standards of

light. Apart from the fact that the candle has held the position of "le gal standard" for 50 years or more, it is evident that it possesses many advantages as compared with the proposed substitutes for it, which require to be prepared, to a greater or less extent, by the operator. I refer to such things as a standard gas, or a standard lamp for consuming liquid fuels, which must necessarily call for a considerable amount of adjustment and manipulation beforehand. Mr. Grafton treats of the peculiarities of candles, and the effect of the idiosyncrasies of the wick as regards such, and shows that it is quite possible, by the exercise of ordinary intelligence and skill, to get a candle to burn its proper quantity and to give a practically constant flame. Some of the points named must have occurred to anyone who has used the photometer with reasonable care and acuteness, whilst others are the result of closer observation and working. Another attractive feature is that they can be repeated and verified at any ordinary photometer, without the aid of additional accessories. Let us hope that his researches will reduce the discrepancies so often evidenced between the results of expert photometrists, which are so marked as to excite the amazement of the thoughtful and the ridicule of the unthinking public.

The subject of petroleum and its uses has lately attracted a great deal of attention. Two important papers bearing upon it have lately been read before the Society of Arts. The first is by Mr. W. Topley, F.R.S., a gentleman connected with the Geographical Survey of England. In considering the theories advanced as to the origin of petroleum, attention was directed to the fact that this was of importance in regard to the probable duration of the petroleum supply. American scientists had agreed that it resulted from the decomposition of animal remains, and also those of plants in some cases, that were present in the shales and limestones of the Silurian and Devonian rocks. And the author considered that the organic theory best explained the facts observed over the greater part of North America. But many Russian chemists believed that petroleum had a purely chemical origin. In the first case the store of petroleum must at some time or other come to an end, like that of coal; but in the second it was possible that the formation might proceed as fast as the consumption. A description of the geological conditions under which petroleum is found in the United States, Canada, Russia and other parts of the world was included in the paper, together with a large variety of information and statistics, etc.

The second paper was entitled "The Uses of Petroleum in Prime Motors," the author is Prof. William Robinson. It appeals more especially to engineers than the first named, on account of the large amount of practical information as to the properties of petroleum oils included in it. For example, it begins by giving particulars of specific gravity, flashing point, color, odor, boiling point, etc., of typical samples of petroleum. These are followed by some interesting researches on the subject of fractional distillation as illustrating the circumstances under which the fluid is converted into gas or vapor. The loss by evaporation when exposed to the air, and the pressure of petroleum vapor at various temperatures next receive attention. The use of petroleum as a substitute for coal gas in the cylinder of internal combustion engines, and also that of its application as a substitute for steam by evaporating under pressure and admitting the vapor to a cylinder, are fully treated, practical examples of apparatus on each principle being explained. The possibility of converting the oil into gas and using it in a gas engine of ordinary construction, with examples of oil gas apparatus, are next considered, and lastly, its use as a liquid fuel for raising steam in ordinary boilers. These few particulars are sufficient to show that the paper contained much that is both interesting and useful to gas men. It is evident, that to some extent the introduction of petroleum and such like liquids is following in the footsteps of gas. There is not only the petroleum lamp, but also the petroleum stove, and the petroleum engine.

I have recently had some experience in the way of letting high power gas lamps on hire, for both external and internal lighting of shops. The result has been extremely satisfactory and goes to show that in many towns it is capable of constituting a line of business as important as that of letting out cooking stoves. A good make of regenerator burner must be selected, that has no delicate parts liable to be choked or broken, and can be readily taken apart for cleaning. A regular quarterly rental should be fixed upon, sufficient to include cost of fixing, keeping clean, and in proper repair, etc., and the gas company should retain control over the light. Three or four such lamps, properly disposed outside a store, will light up the windows in a very efficient manner, giving a white and steady light equal to anything that can be done by electricity, and forming an attractive advertisement. The light being outside there is absolute safety as regards fire, an important consideration in the case of light drapery and fancy goods, and there is also no heat or products of combustion, so that silver and plated goods can be freely exposed without fear of tarnishing. This plan also forms an important feature in the difficult work of educating the gas consumer by leading him to consider how to obtain a maximum of lighting value from a minimum of gas. At a time when oil and electricity are coming forward with the help of the latest scientific discoveries, it is well that gas suppliers should see that their specialty is not unfairly handicapped by being used through fittings and burners of old fashioned and inefficient kind. If the consumers will not adopt the modern improvements, then the company will do well to illustrate them at their own expense. It is both easier and cheaper to keep customers than it is to get them back, and those who are over cautious at the present time will certainly have reason to regret their lack of enterprise if they live another few years. The high power lamps answer the double purpose of competing with electricity, or keeping it out, which is better still, and also with oil lamps of 20 to 100 candle power, which have been introduced with more or less success all over the country, and especially in towns where, thanks to the sluggishness of the local gas company, the public are not aware that an equally bright light can be obtained from gas, in many instances at a cheaper cost.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We are indebted to "Observer" for the following: "At the annual meeting of the Portland (Me.)Gas Light Company the following Directors were chosen: Edward H. Daveis, W. W. Thomas, W. H. Moulton, Fred N. Dow, Charles S. Fobes and Charles D. Clark. Mr. Fobes assumes the place formerly held by Col. Chas. B. Merrill, deceased, and Mr. Clark represents the city. The following is the report, presented on behalf of the Directors, by President E. H. Daveis, respecting the operations of the Company for the twelvemonth: 'The consumption of gas for the year ending April 30th ult., was 52,474,100 feet against 50,470,600 feet the preceding year, a gain of 2,003,500 feet, but owing to rebates to large consumers, the amount received for gas is $2,512.52 less than the preceding year. The number of consumers is 3,010, against 2,972 a year ago—an increase of 38. Five thousand three hundred and sixty-seven tons of coal and 80 tons of oil have been used, yielding 59,006,000 feet of gas, averaging 18.6 candle power, being at the rate of 4.93 feet per pound. Owing to a greater demand for coal tar the price has advanced until it has been found profitable to sell our tar and burn more coke. We have received for tar $3,914.60 and for coke $7,254.90, against $8,283.18 received for both the preceding year. The difference is not all profit as less labor is required when burning tar, and better heats are kept up. Eighty-six feet of 4 inch main pipe have been laid on West street and 428 feet of 3 inch pipe on Chadwick, Crescent, Grant and North streets, making the whole extent of our mains about 27 miles and 7 furlongs. The expense for repairs has been greater than usual, amounting to $7,637.45 for the year. It includes 45 new retorts, with an improved style of setting, a new exhauster and a sewer extending through the sea wall. The bills for completing the office building on Temple street, amounting to $2,728.32, have been paid from the renewal fund. Strikes at the mines last year made it very difficult to get a supply of coal, and we were obliged to take some of the inferior quality. Your Directors have, therefore, thought best to secure a supply early this season, and it has been contracted for on favorable terms.'"

Mr. William Anderson has decided to accept the position of Superintendent of the East Boston (Mass.) Gas Light Company, and will assume the duties thereof on or about July 1st. While the Marlboro (Mass.) Company, whose manufacturing department is now and has for some time back been under Mr. Anderson's control, will be the loser thereby, the proprietors are, nevertheless, pleased at having their manager called on to take a higher place. Mr. Anderson's careful methods and sound training are sure to be appreciated by the East Boston Company; and we wish him all possible success.

The Plainfield (N. J.) Electric Light Company has given legal notification of the assignment of its street lighting contracts and business of every description to the Plainfield Gas and Electric Light Company.

In the indictment by the grand jury of the Davenport (Iowa) Gas Company, it is charged that the corporation has "maintained a nuisance which has killed the fish in the river, injured boats, injured the health of the people, and has annoyed people at a distance of 10 miles from the city." The correspondent who forwards that adds: "The grand jury of Scott County, however, can see no reason for indicting the Davenport saloons, though a State law declares them nuisances, and though it is indisputable that they kill people (not merely fish) and injure the

health of unmeasurably more of the inhabitants of the city than it is possible for the gas works to injure. Another example of seeing the mote and not discovering the beam."

THE stockholders of the Batavia (N. Y.) Consolidated Gas and Electric Company are to vote to-day on a proposition to increase the capital stock from $100,000 to $125,000.

AT a special meeting of the shareholders of the New Bedford (Mass.) Gas Company the revised by-laws were adopted. One change is that the annual meeting day is hereafter to be the first Monday in August, instead of the first Monday in July, as formerly.

THE franchises and plants of the Texarkana (Ark.) Gas and Electric Light Company have been purchased by Mr. M. P. Hillyer and others. The purchasers are to take the property over on the 14th inst.

THE injunction suit urged by the State to restrain the Laclede Gas Light Company from purchasing and operating the plant of the Municipal Electric Light Company, of St. Louis, which was to have been heard on May 21st, was postponed to Thursday next, owing to the unavoidable absence of Judge George A. Madill.

THE works at Austin, Tex., the control of which was sold to certain capitalists by the owners—Messrs. A. E. Judge and Sylvester Watts—will hereafter be managed by Mr. H. W. Bierce.

THE New Albany (Ind.) Electric Light, Heat and Power Company has assigned to Charles W. Sowle. The estimated liabilities are $50,000, and the assets are put at $38,000. The Company is capitalized in $75,000.

THE Thwing Electric Company, with offices at 132 West Lake street, Chicago, Ills., is insolvent, and many executions have been issued against its effects.

WE might further say, in connection with the New Albany Company's failure, that the concern was chartered in October last, and that it possesses a first class station. It is understood that it has capacity for maintaining 5,000 16 candle power incandescents and 100 high power arcs.

MANAGER HUGHES notified the residents of Bismarck, North Dakota, on May 15th, that the local electric light plant would be shut down. Our advices containing this report also state: "This was to be expected. No plant can be sustained, unless the city maintains street lighting. Even with this support a plant cannot be made to pay interest on the investment as the patronage of private individuals is now down to the minimum. It is to be regretted that the light cannot be maintained. It is an obscure town in this age that does without modern light. It was hoped private patronage would maintain the light independent of the city's support." All of which is very pretty in the abstract, but modern practice is very much similar to what the ancient practice was in the matter of obtaining the best service for the least amount of recompense. To put it very boldly, and accepting the inference that gas light is the light of antiquity, there is no doubt in our minds that while Bismarck cannot support an electric light company, a fairly capitalized, well-managed gas company in Bismarck would bring in a good return to its proprietors.

THE Anglo-American Gas Control Company, of San Francisco, Cal., has been organized.

IN the last twelvemonth the sum of $35,000 was invested at Rockford, Ills., in new street mains and in repairs to old ones, and a better investment was never made by the proprietors.

MR. GEORGE SYKES has been chosen President of the Rockville (Conn.) Gas Light Company, vice Mr. George Maxwell, deceased.

A SUIT against the Manchester (N. H.) Gas Company has been instituted by Jeremiah Ready, who asks for $10,000 damages, basing his demand on the queer ground that, while in the employ of the Company, a splinter from a defective bar entered his eye, causing injuries to that organ so serious that the eye had to be removed.

AT a special meeting of the stockholders of the Pulaski Gas Light Company, of Little Rock, Ark., Major Dean Adams tendered his resignation as President and as a member of the Board of Directors, and the Honorable Frederick Kramer was elected to the vacancy in the Board. The Board subsequently selected Mr. Kramer as President, and that gentleman is now in charge.

IN the meantime the many Eastern friends of Major Adams will be pained to hear that business reverses obliged that gentleman to take the course above noted, and all will join in the wish and echo the hope that fortune's flight will speedily restore to him a goodly share of affluence.

OVER 500 gas stoves are now in use at Rockford, Ills., and although the sale of these (only 33 ranges were placed in the city last year) was not extensive in the summer of 1890, the reverse will hold good this season. In April last 19 large ranges were placed; also, 30 boiler and water heating stoves. The demand in May also kept pace with that of April.

THE following from the Brooklyn (N. Y.) *Daily Eagle*, respecting the gas rate muddle in that city, will be of interest: "A conference of the Presidents of the different gas companies for the purpose of taking some action upon the vexed question of the price of gas was held, those present being General James Jordan, of the Fulton-Municipal; Frank Lyman, of the old Brooklyn; S. A. Lathrop, of the Citizens; Charles H. Stoddard, of the Metropolitan; H. P. Morgan, of the Nassau; and Henry Steers, of the Williamsburgh Gas Companies. To the assembled gas magnates there were submitted the opinions of the counsel for the Companies. These seven legal advisors for the seven corporations had met twice and exhaustively examined the question submitted to them, which was this: Assuming that the Legislature has the power to fix the price of gas, what is its price now? Two reports were presented. One, signed by five of the seven counsel, maintained that, in the opinion of the learned men presenting it, the legal price of gas is still $1.50 per 1,000 cubic feet. The argument submitted favoring this went into the question of the intent of the lawmaking power. The so called Jones bill, repealing the Hotchkiss bill and fixing the price of gas in Brooklyn at $1.50, instead of $1.60, was before both houses 13 times altogether. The commissioners on the revision of the statutes confess that it was their error that the Hotchkiss bill was reaffirmed in a so-called transportation bill and signed by the Governor. To rectify their mistake this year they prepared and urged the Cooney bill and also included the Jones bill in this year's revision of the general corporation laws. From this complete chain of evidence the five lawyers agree that it was the intent of the Legislature to fix the price of gas at $1.50 per 1,000, and that $1.50 is therefore the legal price. Two of the seven, however, present a report disagreeing with this. The intent of the Legislature is a valid argument in the interpretation of the meaning of the bill, but is not sufficient to destroy the effect of a measure which became the law subsequent to the bill in which the intent was shown. Thus they claim, assuming that the Legislature has the power to fix the price of gas, it is probably that $1.25 is the legal price, *de facto*, whether *de jure* or not. Upon these two conflicting reports the gas presidents argued. They were not unanimous in their opinions at all. Some said that it would save trouble if they let the thing slide and charged $1.25. Others thought it a duty to the stockholders in their companies to contest the matter in the courts. As the Boards of Directors of the Williamsburgh and Nassau Gas Companies had not met yet, the Presidents of those Companies were in no position to take decided action. Another conference will be held shortly to finally settle what shall be done."

WE regret to be called on to announce the death of Mr. William R. Barry, who for the past 11 years has acted as Superintendent of the Derby Gas Company, of Birmingham, Conn., under Mr. Chas. H. Nettleton. Deceased was a competent, trustworthy man, and Mr. Nettleton will miss him very much.

WE are in receipt of a very handsomely gotten up catalogue, profusely illustrated, that is being distributed by the Berlin Iron Bridge Company.

MR. E. A. PINKNEY has been in charge of the works of the Utica (N. Y.) Equitable Gas and Electric Company since April 1st.

MR. JOHN CABOT, the gas works tray manufacturer, of this city, writing under date of May 23, among other things says: "Tray work is good; 50 per cent. better than up to corresponding time last year. Gas managers seem to be moving earlier than usual this year. We are also working up a very good line in fitting up scrubbers with trays, having many orders ahead."

WE are indebted to a Wheeling (W. Va.) correspondent for the following: "A meeting of the Council Committee on Ordinances was held on May 21 for the purpose of considering the ordinance drawn by Solicitor Riley, by instruction of the Committee, providing for the submission to the voters of the city of an ordinance authorizing a loan of $80,000

to construct an electric light plant, or rather to assist in the construction, as a part of the necessary fund is to come from the revenues of the gas works. Clerk Hanke read the ordinance and the Committee amended it in several respects. As finally agreed on for submission to the Council, the ordinance provides that the question shall be submitted to a vote of the people whether the city shall issue bonds to the amount of $80,000 for the purpose named, the bonds to be of the following description: 100 bonds for $100; 100 for $500; and 40 of $1,000; the last of the bonds are to mature in 1901, and they are to bear interest at 6 per cent. They are also to be exempt from city taxes. The Commissioners are to redeem $8,000 worth of bonds on the 1st of October of each year, and if that amount cannot be redeemed with the consent of the holders, the Commissioners shall select what bonds shall be redeemed by lot. The Commissioners are to receive ½ of 1 per cent. commission for the money disbursed by them. As to this arrangement, Mr. Riley explained that in former years the city made the commission payable on the sale of the bonds, with the result that the Commissioners would sell them and then resign. The new way keeps them interested until the money is all disbursed. They also receive $50 a year for clerical services, and are debarred from taking any other compensation."

THE Street Committee of the Board of Supervisors, of San Francisco, Cal., have decided to request the California Electric Light Company to replace all the large 16,000-candle power mast lights with lamps rated to 2,000 candles.

THE following is from the Indianapolis *News*, of May 20th: "Will Indianapolis enjoy the convenience of artificial fuel gas? This is a question that many persons ask every day. It is the question which a *News* reporter put to President C. F. Dieterich, of the Indianapolis Gas Company. The question was qualified further by the statement that if natural gas cannot be supplied to those parts of the city now without this precious fuel, the artificial fuel gas should be fed them through the present artificial gas mains. 'Artificial fuel gas,' said Mr. Dieterich, slowly and emphatically, 'is a most thorough success. I know that, for I use it in my house at New York. Its use is spreading every day, and in the big Eastern cities hundreds of artificial gas cooking stoves are being sold daily. But its economy from a financial standpoint is different there and at other cities from what it is here. The gas cannot be manufactured cheaply enough here to compete with coal. The same amount of gas that is required to produce the same heat as a ton of coal would cost three times as much as here, hence its economy in dollars is nothing. Of course, from the standpoint of wear and tear, cleanliness and convenience, no one will gainsay its economy. But to put artificial fuel gas upon the market, in competition with coal at $2.50 per ton, is an impracticable thing.' Will the Company make any extension of its natural gas mains? 'The Company does not desire to make any extensions, and is not at present contemplating any service extension. We must necessarily make field extensions in order to keep our source of supply equal to the demand. Last year we were under heavy expense making extensions; this year we will have to spend $125,000 more, and go 15 miles further in the field for new wells. You see we keep going further every year. This year 15 miles of 8 inch pipe will be laid in order to supply our customers with gas next winter. At present we are only 25 miles from the center of the gas belt, which is given as Alexandria. Here, I will illustrate with my hat crown. Let it represent the gas belt, and just beyond its edges I will locate Indianapolis. Now, at the center of the belt the pressure is greater than else where, gradually lessening as the limits are reached. We begin at the nearest practical point to Indianapolis and dig our wells. Many were found that are seemingly inexhaustible. Yet some of those to-day are worthless and others are failing. The nearer to the center we go after the gas the shorter the limit of years to its life, for when we have reached the center we must stop. Nature has blessed Indiana with its lavish supply of gas, and the quantity is so great that with careful husbanding it can be made to last for many years. But the way that gas is wasted in Indiana is awful. Why, enough gas is absolutely wasted in one year to supply the necessities for two years. The Legislature and the people generally will yet regret that no legislation protecting the gas supply by the most stringent means was enacted in the last General Assembly.'"

THE "Garment Pressmen's Union," of Boston, Mass., recently requested the various clothing contractors of that city to abolish the use of gas heated irons.

Mr. C. R. MILLER, of the Marquette (Mich.) Gas Company, writes that important improvements are to be made on the plant this season. Among these we note a new purifying house (52 feet by 53 feet), to hold three boxes, 12 feet square, each; a Connelly governor and a new station meter. He will also add two miles of mains to the distributing system and replace 4,000 feet of 6-inch pipe with 10 inch pipe. All the services on this particular line will be renewed. This is satisfactory evidence of the vitality of the Marquette Company, whose works end is ably managed by Mr. Miller.

Mr. C. F. Hetzel, who is the agent in this city for the gas stoves manufactured by the American Meter Company, recently booked a large order that is worth mentioning as showing the great advance that is making in the use of gas for cooking purposes in New York. The Nevada is a very imposing "flat" or apartment house on Broadway, running from 69th to 70th streets, and the owner and builders thereof, having looked the market carefully over, finally decided to equip the kitchens of each suite of apartments with an enlarged No. 8A Economy Cabinet Range. As there are 42 apartments this order means the placing of 42 ranges. The range is made of cast iron, and is thus described in the American Meter Company's catalogue. The baking and roasting ovens are fitted with a new and powerful radiating burner for broiling, roasting, toasting (under the flame, as before an open fire), baking, etc. The hot plate is 22 inches wide, and 17 inches deep, fitted with side shelves, 6 inches wide and 17 inches deep, and is supplied with four boiling burners, two of which are double. The fixtures included are a steel spit and a deep pan for roasting; also gridiron and drip pan for broiling. It consumes 60 feet of gas per hour with all the burners in full use. The dimensions of the stove are:

Stove.	Oven.	Roaster.
34 inches high	10 inches high	12½ inches high.
20 " wide	16½ " wide	20 " wide.
16 " deep	15 " deep	16 " deep.

THE Kings County Gas and Illuminating Company has filed a certificate setting forth an increase in the capital stock from $100,000 to $400,000.

MR. JOHN CHAMBERS, who resigned his position as Assistant Superintendent of the Milwaukee Gas Light Company some weeks ago, was presented with a handsome desk, book case and office chair by his former associates.

FOUR employees of the Detroit Mutual Gas Company were more or less burned because of an explosion of gas in or about a drip-pump at which they were working.

SOME days ago Mr. John H. Hodgson, Superintendent of the Westerly (R. I.) Gas and Electric Light Company, met with a painful accident. While enjoying a walk he slipped and fell heavily on a rough stone, sustaining severe bruises. He will be about in a few days.

AT the annual meeting of the Bellaire (Ohio) Gas and Electric Light Company no change was made in the executive management.

THE capital of the Joliet (Ills.) Gas Company has been increased to $150,000.

THE Lynn (Mass.) Gas and Elecric Light Company's main system is being greatly improved, and the direction of the work is under the immediate charge of Mr. Charles F. Silsbee. The residents of Clifton and also what is known as the E. B. Hayes tract will have an ample gas supply when the main work is completed.

The Dangler Stove and Manufacturing Company, of Cleveland, O., has opened branch headquarters, in this city, at Nos. 40 and 42 College Place. The Company has also arranged with Mr. Thomas Holt, 111 and 113 North Second street, Philadelphia, Pa., for a display of its goods in that city.

The Market for Gas Securities.

There was nothing of moment in the city gas share market during the week, prices having been fairly well maintained, but the demand was next to nothing. Consolidated opened to-day (Friday) at 99 to 99½, which is a slight advance over last week's prices. Other city shares are dull and strong. This afternoon the officials of the Brooklyn Companies will settle the line of action to be taken in respect to the gas rate in the future, and not a few hold to the belief that the $1.25 figure will be accepted, and that a consolidation agreement will then be perfected. As it seems to us, this is the best way out of the difficulty. In the meantime, there is no change in the bid prices for the shares. Chicago hovers around 50, and it is likely soon to take an upward movement. Laclede common is weaker, at 15½ to 16½, and it is a queer commentary on the management who recently requested their Chief Engineer to resign on the ground that he was too high priced a man. Do they expect to make more money by employing low-priced engineers than by intrusting their works to the care of experienced engineers? The general situation is in favor of investors.

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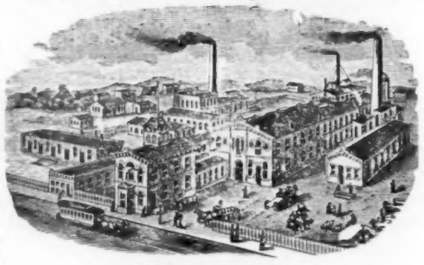

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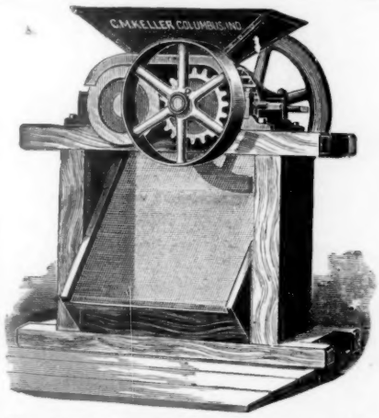

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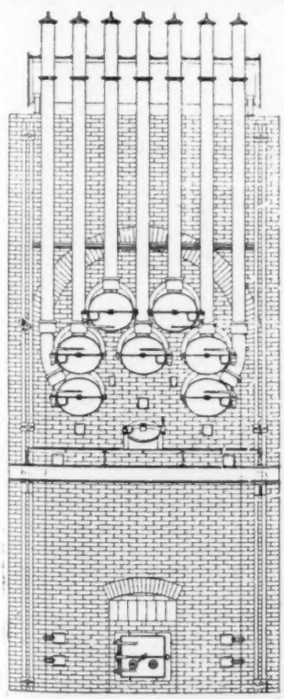

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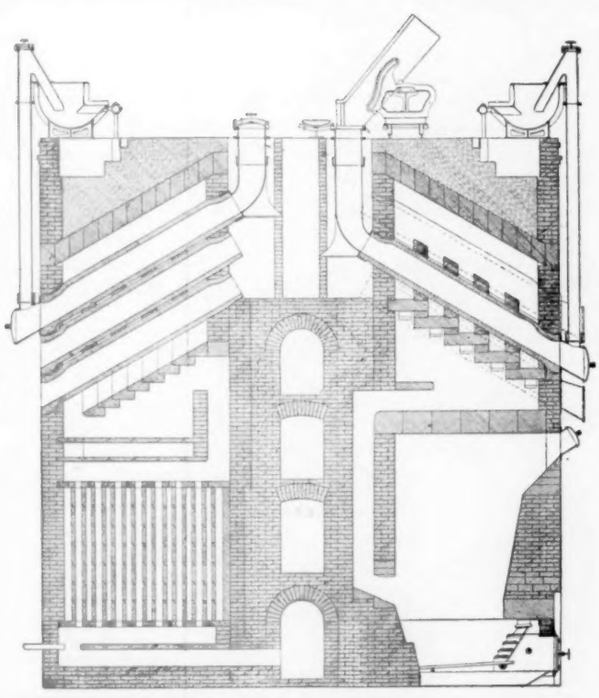

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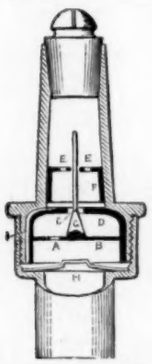

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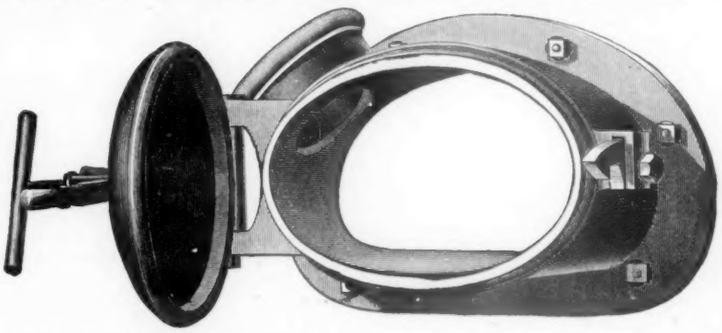

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HOT WATER DEVICE

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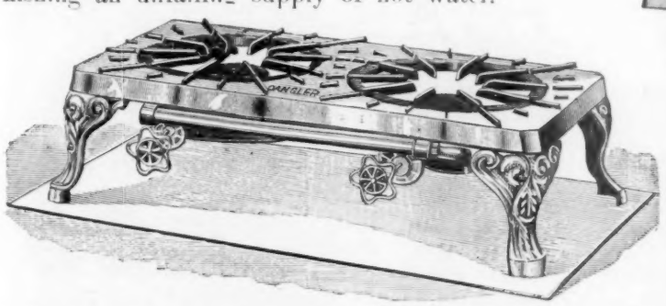

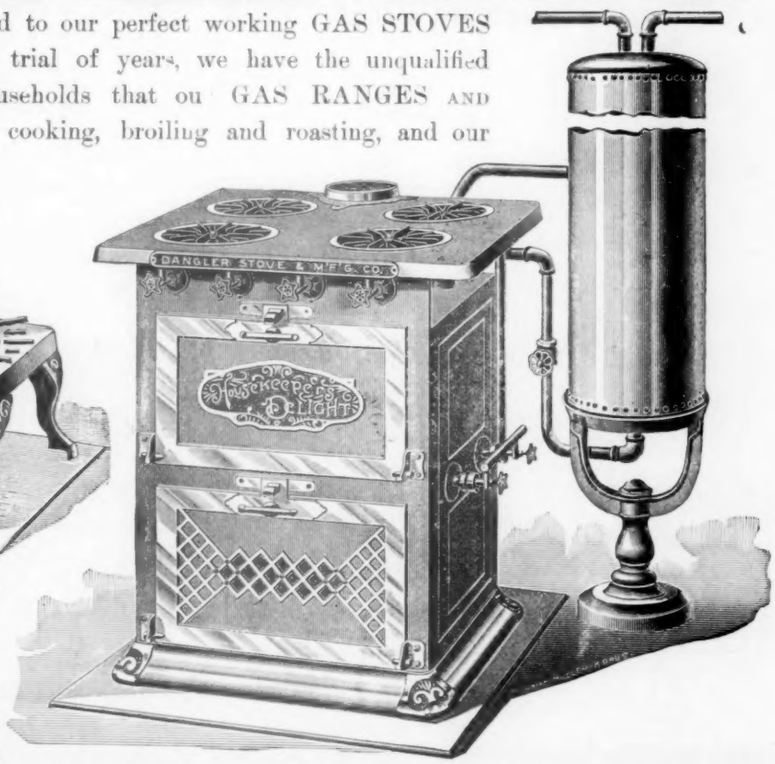

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This is much less per candle power than it can be furnished by the use of cannel coal or by vaporizing naphtha. With our process we improve the whole output in color—viz., whiten the flame with the oxygen, as well as furnishing a *thoroughly fixed* gas, and no possible danger of separation as there is with vapor. Correspondence solicited.

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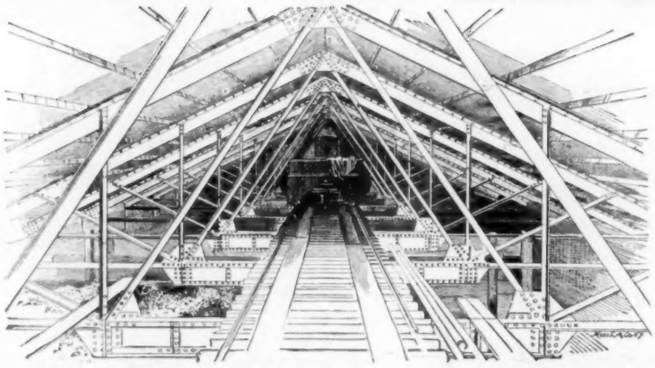

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The above illustration shows the construction of an iron truss roof built by us for the Burlington City Water Works, at Burlington, Vt. The photograph is taken in such a manner as to show the construction of the roof, which carries a coal car through the entire length of the building. The building is used for storing coal, the coal being delivered into the building along the line of the roof truss; as it dumps from the car it spreads itself, and thus saves one handling.

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Extracts the Whole of the Ammonia and a Large Percentage of the Sulphureted Hydrogen and Carbonic Acid.

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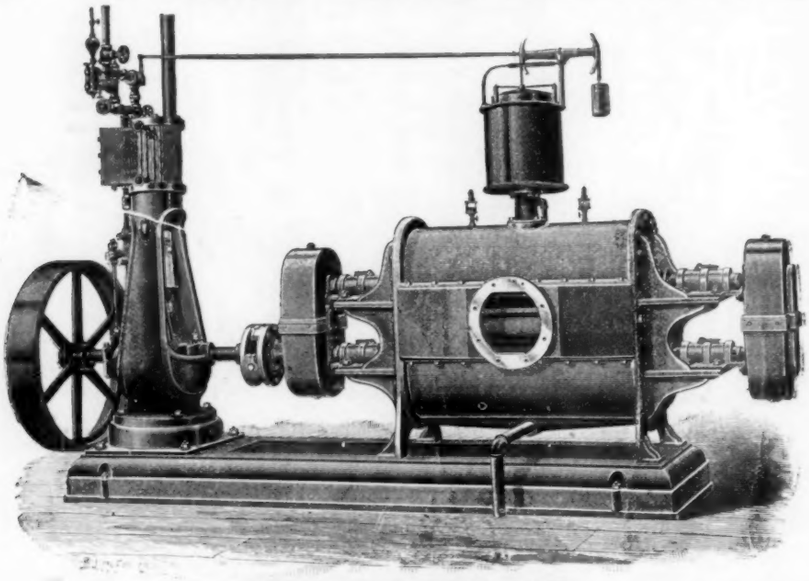

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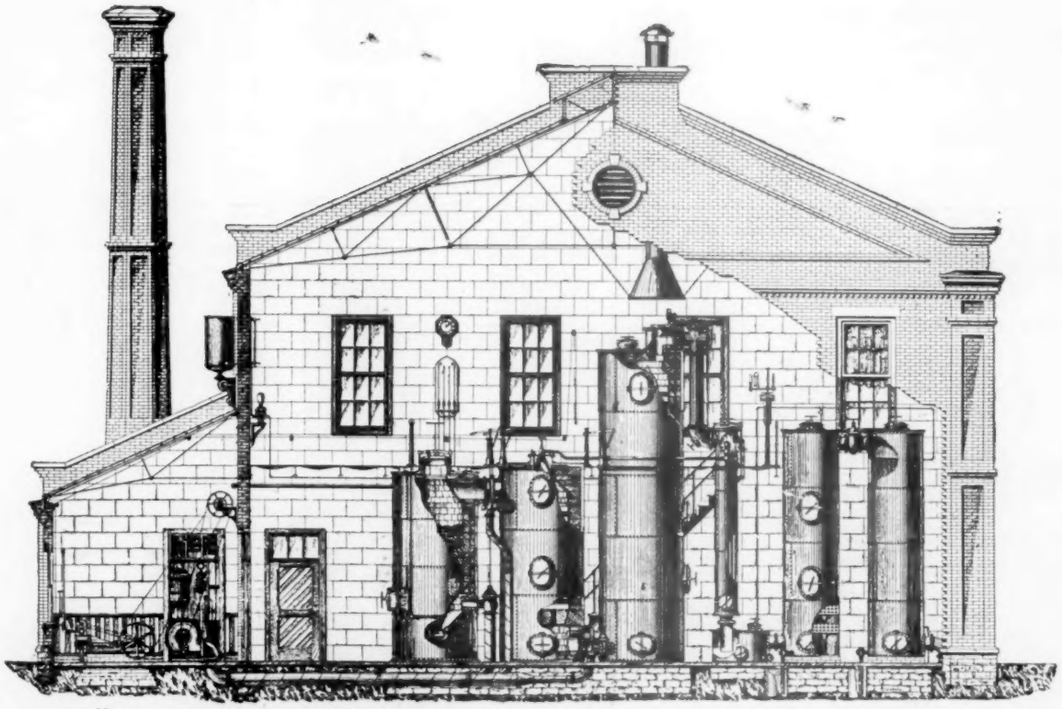

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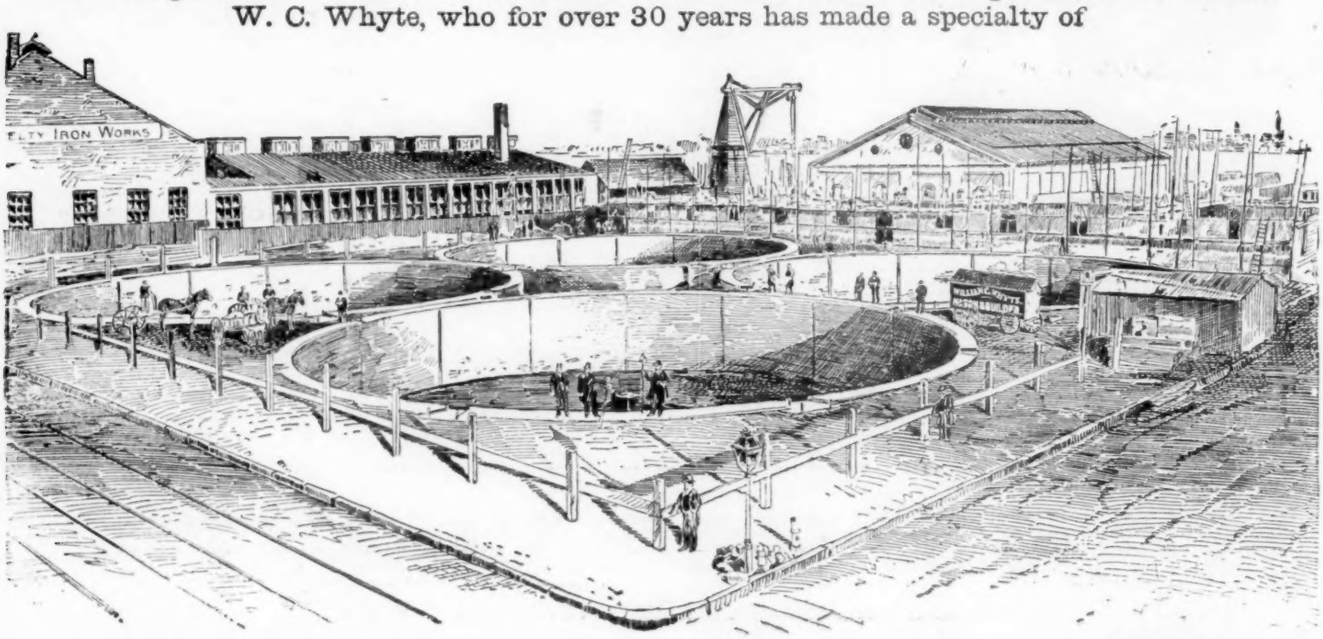

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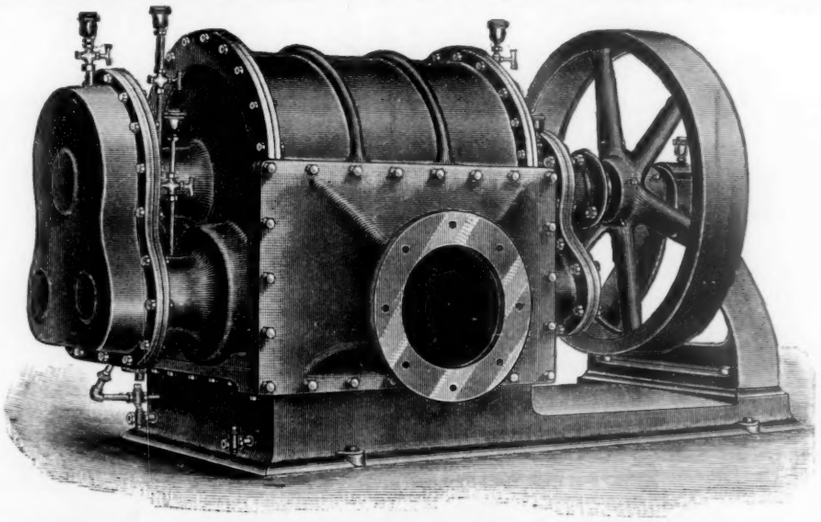

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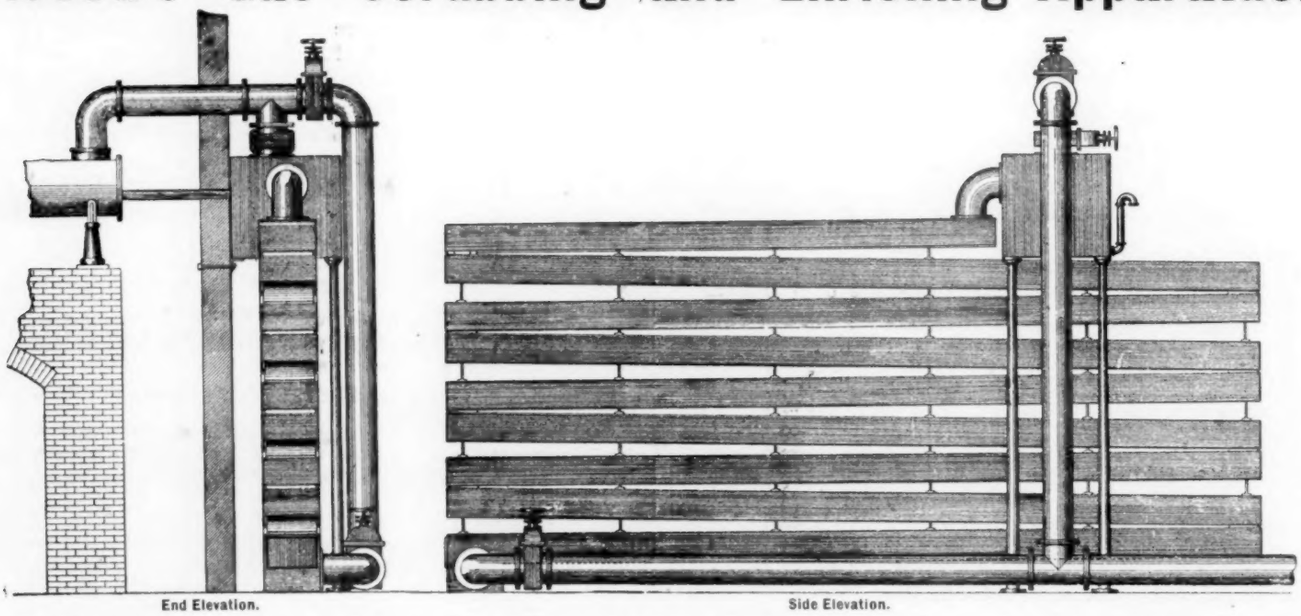

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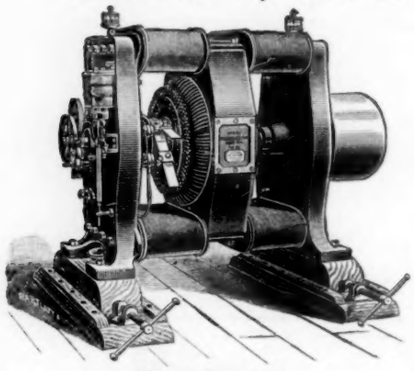

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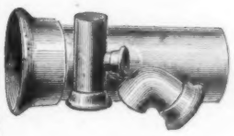

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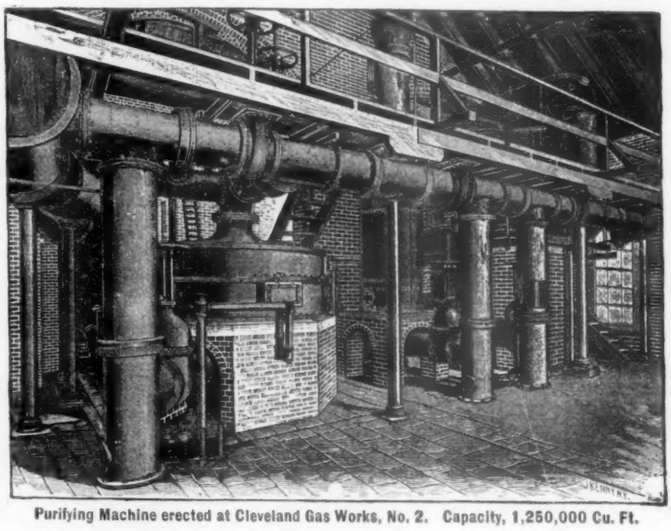

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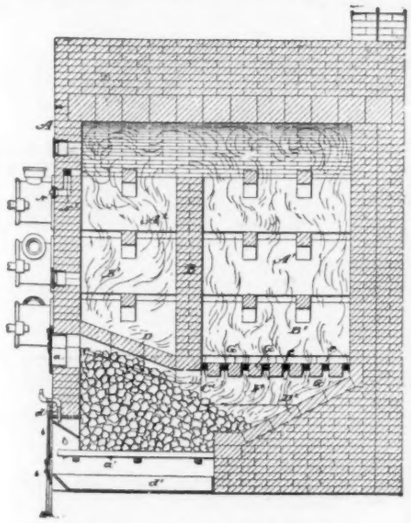

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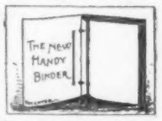

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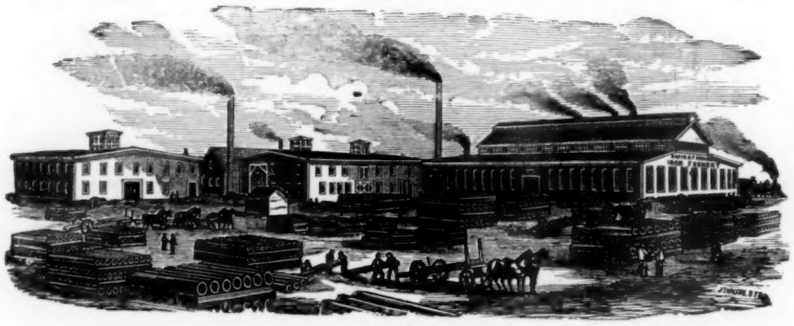

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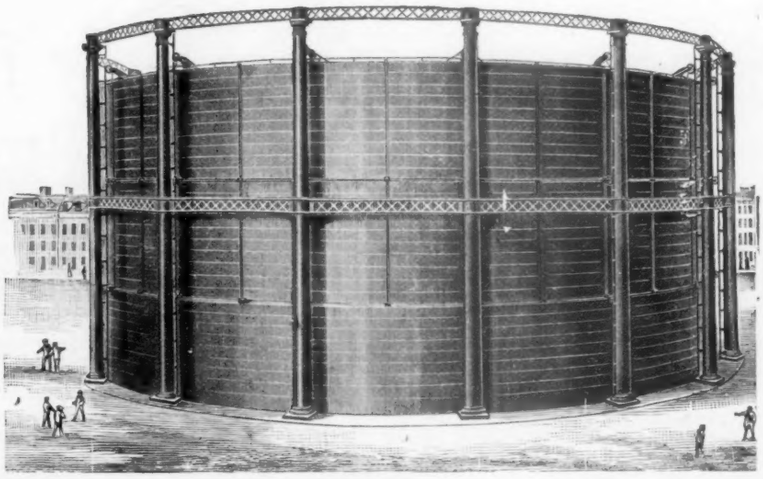

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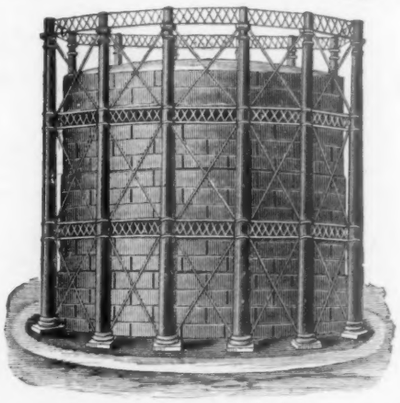

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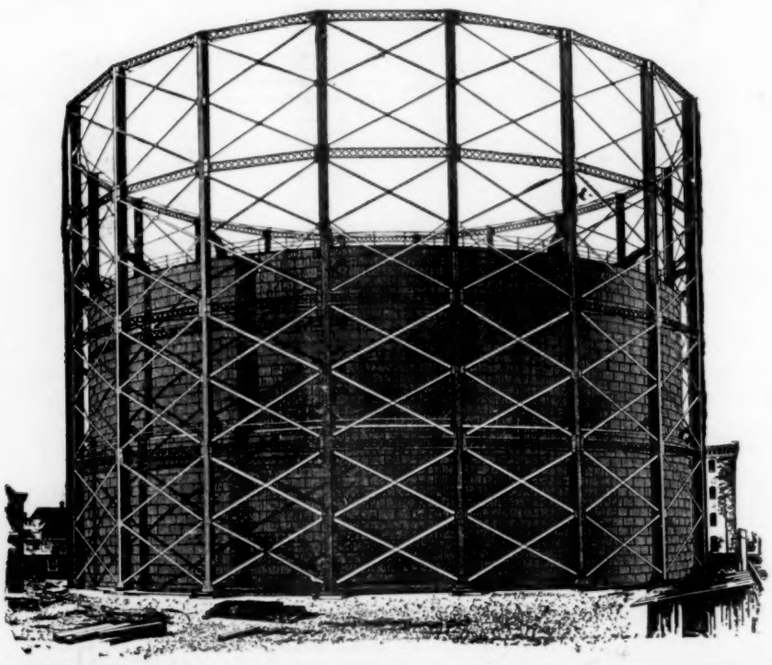

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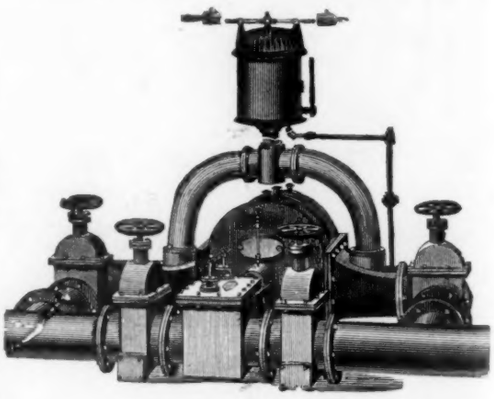

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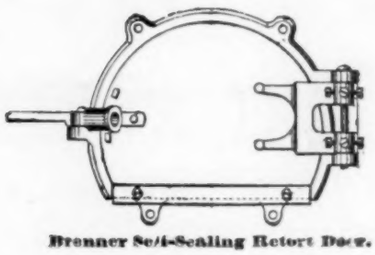

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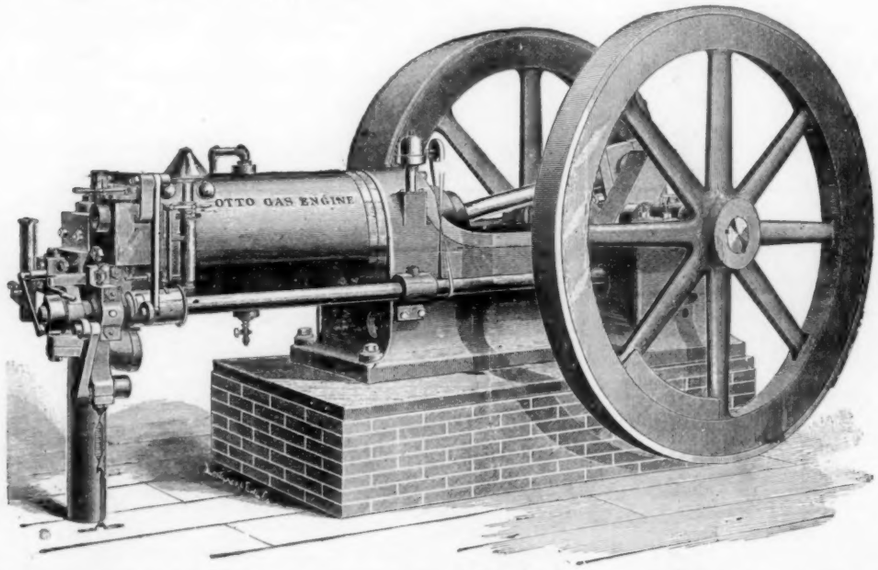

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